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Capital (and Earnings) Incentives for Loan Loss Provisions in Brazil: evidence from a crisis-buffering regulatory intervention

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Non-technical summary

Reported regulatory bank capital is an important indicator of a bank's capital adequacy (vis-à-vis unexpected losses) to the market, banking regulators and supervisors. Similarly, reported bank earnings are an important signal of a bank's profitability to its stakeholders. Nonetheless, deciding whether reported capital and earnings of a bank are at sound or desired levels typically requires obtaining and analyzing further information from the bank, the real economy and the financial markets. However, this is costly, so that market participants may prefer to focus instead on whether these figures are close to their supposed benchmarks. Because of that, the banks themselves may adopt a smoothing behavior towards those implicit benchmarks or targets. For that purpose, they may take discretionary accounting actions that increase capital and earnings when they are relatively low and decrease them when they are relatively high. One major accounting variable used for that goal are loan loss provisions (LLP). LLP typically convey estimates of realized and expected loan losses but are also normally subject to a great degree of discretion in accounting regimes. As LLP represent an expense in the profit and loss statement, it typically diminishes retained earnings and, consequently, the regulatory capital base.

To help in the econometric identification of such bank smoothing behavior, this paper makes use of a regulatory shock in Brazil that allowed the increase of regulatory capital through the recognition of excess (discretionary) loan loss reserves in its computation. That intervention was carried out in a time when the global financial crisis was beginning to hit Brazilian markets, therefore in a sort of countercyclical policy. The resulting net effect of an increase in discretionary LLP on regulatory capital became positive during the regulatory change. The change aimed at providing higher incentives for LLP of (lower capital) banks when bad times were looming ahead and, consequently, expected loan losses were also potentially growing. This paper shows evidence of capital smoothing through LLP during the regulatory change but not outside it, consistent with a view that accounting discretion is, particularly, exercised by banks in distressed times. More specifically, this paper shows that banks with lower capital increased more discretionary LLP during the regulatory change than banks with higher capital. However, there is no statistical significant association between capital and discretionary LLP under the standard regulation. Furthermore, evidence on earnings smoothing is valid throughout the sample period: banks with lower earnings made less discretionary LLP than others, so as to increase their reported earnings. This study also points to an existent expected loss component in discretionary LLP.

Sumário não-técnico

O capital regulatório reportado por um banco é um importante indicador da adequação de capital do banco (em relação a perdas inesperadas) para o mercado e para reguladores e supervisores bancários. Similarmente, os resultados bancários reportados são um importante sinal da rentabilidade de um banco para as partes interessadas. Não obstante, decidir se o capital e os resultados reportados de um banco estão em níveis sãos ou desejados requer normalmente a obtenção e análise de informações adicionais do banco, da economia real e dos mercados financeiros. Todavia, isso é dispendioso, de modo que os participantes do mercado podem preferir se concentrar em saber se esses números estão próximos de seus supostos *benchmarks*. Por conta disso, os próprios bancos podem adotar um comportamento de suavização em relação a esses *benchmarks* ou metas implícitas. Para esse propósito, eles podem adotar ações contábeis discricionárias que aumentem o capital e os resultados quando eles forem relativamente baixos e reduzam-nos quando eles forem relativamente altos. Uma destacada variável contábil utilizada para esse fim são as provisões para perdas de empréstimos (*loan loss provisions* - LLP). A LLP tipicamente transmite estimativas de perdas realizadas e esperadas dos empréstimos, mas também está normalmente sujeita a um grande grau de discricionariedade em regimes contábeis. Como a LLP representa uma despesa nas demonstrações de resultados de exercícios, ela tipicamente diminui os lucros acumulados e, consequentemente, a base de capital regulatório.

Para ajudar na identificação econométrica de tal comportamento de suavização dos bancos, este artigo faz uso de um choque regulatório no Brasil que permitiu o aumento do capital regulatório através do reconhecimento dos excessos (discricionários) de reservas para perdas de empréstimos na computação desse capital. Essa intervenção foi levada a cabo em um momento em que a crise financeira global estava começando a atingir os mercados brasileiros, portanto numa espécie de política contra-cíclica. O efeito líquido resultante de um aumento na LLP discricionária sobre o capital regulatório tornou-se positivo durante a mudança regulatória. A mudança objetivou proporcionar maiores incentivos para a composição de LLP dos bancos (particularmente aqueles com menor capital) quando tempos ruins projetavam-se adiante e, consequentemente, as perdas esperadas de crédito estavam também potencialmente crescendo. Este artigo mostra evidências de suavização de capital através de LLP durante a mudança regulatória, mas não fora dela, consistente com a visão de que a discricionariedade contábil é particularmente exercida pelos bancos em tempos de *estresse*. Mais especificamente, este artigo mostra que bancos com menor capital aumentaram mais a LLP discricionária durante a mudança regulatória do que os bancos com maior capital. No entanto, não há associação estatística significativa entre capital e LLP discricionária sob a regulação padrão. Além disso, a evidência sobre a suavização de resultados é válida ao longo do período amostral: bancos com menores resultados compuseram menos LLP discricionária que outros, de modo a aumentar seus resultados reportados. Este estudo também aponta para um componente de perda esperada existente na LLP discricionária.

Capital (and Earnings) Incentives for Loan Loss Provisions in Brazil: evidence from a crisis-buffering regulatory intervention[1]

Ricardo Schechtman[2]

Tony Takeda[3]

Abstract:

In order to provide higher incentives for loan loss provisions (LLP) of Brazilian banks when bad times were looming ahead, the discretionary excess in loan loss reserves was recognized temporarily as regulatory capital, in a sort of countercyclical policy. This study explores this regulatory change to investigate the capital management incentives of LLP of Brazilian banks. Results show that banks with less regulatory capital increased relatively more discretionary LLP during the regulatory change but not outside it, suggesting that capital management through discretionary LLP was relevant only during that period. On the other hand, banks with less earnings made less discretionary LLP throughout the sample period, suggesting earnings smoothing was relevant during the whole period. Results are robust to different realized and forward loan loss controls, different measures of capital before endogenous items, time-varying capital targets, and to the recognition of possible heterogeneous effects of the global financial crisis across Brazilian banks.

Keywords: loan loss provisions; bank capital management; countercyclical tool
JEL Classification: G21, G28, M41

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1. Introduction

Banks have incentives for using their discretion in accounting decisions to smooth reported capital and earnings (e.g. Wall and Koch, 2000; BCBS, 2015). The reason is that reported earnings and capital may play an important role in imperfect markets because obtaining and analyzing information by market participants is costly, and agents tend to reduce these costs by using benchmarks. A smoothing behavior conducted by banks towards these benchmarks then ensues. The preference for smoothing is also linked to the necessity of reducing bank's funding costs once it signals less risk for equity and debt holders. (e.g. Kanagaretnam et al., 2004).[4] Additionally, management of reported regulatory capital, in particular, could be useful to banks as it is used as an indicator of capital adequacy by the market, banking regulators and supervisors. Not only banks may want to have a comfortable cushion above the regulatory minimum but also too much capital may signal missed growth opportunities.

To smooth reported earnings or capital, bank managers take discretionary accounting actions that increase those when they are relatively low and decrease them when they are relatively high. One major accounting item used for that goal are loan loss reserves (LLR) or, equivalently, their flows, represented by loan loss provisions (LLP). LLR and LLP typically convey estimates of realized and expected loan losses but are also normally subject to a great degree of discretion in accounting regimes. The related empirical literature, discussed later in this section, contains a lot of evidence on earnings management through LLP (though much focused on developed countries) and less on capital management.

From a prudential point of view, smoothing through LLP is not necessarily a bad bank behavior because it could work as a favorable countercyclical tool. Having LLRs higher than realized and expected losses in good times, when earnings could be higher

[4] Moreover, smoothing may be derived as the optimal contracts when risk-averse bank managers have private incumbency benefits and their evaluations depends more on the latest information (e.g. Fudenberg and Tirole, 1995). Furthermore, psychological factors may also favor the pursuit of benchmarks (e.g. Degeorge et al., 1999). On the other hand, smoothing strategies carry inevitable (even private) risks as the business cycle may evolve in unpredicted ways (and maybe even more so in emerging markets). There are also welfare costs associated to earnings/capital smoothing such as the reduction of market discipline due to potentially lower informativeness of the resulting smoothed measures (e.g. Bushman and Williams, 2012, Cohen et al., 2014). However, these costs may not be so high, as investors may acquire knowledge, over the long run, about the earnings/capital policies of banks and, to some extent, be able to see through the discretionary adjustments (e.g. Beaver and Engle, 1996).

too, provides insurance for bad times. However, as LLP represents an expense in the profit and loss (P&L) statement, an increase in LLR typically diminishes retained earnings and, consequently, the regulatory capital base. If maintaining capital is of major interest to (lower capital) banks in order to be prepared for an unexpected growth opportunity while maintaining a comfortable distance to the regulatory minimum, then they may refrain from increasing LLR in good times. The situation would be more problematic, though, when bad times are looming ahead and market participants evaluate that expected losses have indeed increased (while unexpected losses, to which capital is typically linked, have not necessarily decreased).[5] Under these circumstances, lower capital banks are faced with the option of increasing LLP and having to recompose their capital base by issuing new equity in a time of possibly depressed share prices or restricting the distribution of dividends, which may signal weakness in comparison to their peers (e.g. Forti and Schiozer, 2015)[6]. Alternatively, these banks may opt not to increase LLP, forcing capital to also effectively cover part of the expected losses at the cost of its capacity of absorbing the unexpected ones and, consequently, reducing the informativeness of LLR to investors about the true expected risk of their credit portfolios, with generally adverse consequences to market discipline (e.g. Bushman & Williams, 2012). Therefore, in such scenario there is likely scope for welfare improvement if lower capital banks could adjust LLRs to the new risks looming ahead without consuming their capital base. This paper investigates the efficacy of a regulatory intervention of that type implemented in Brazil to deal with the potential impacts of the global financial crisis on Brazilian banks. It finds evidence of a capital-driven change in bank provisioning behavior during the intervention.

This paper relates to the empirical literature on capital and earnings management. This literature has mixed results on the capital management incentives of provisioning. Ahmed et al. (1999), Kim and Kross (1998), Beatty et al. (1995) and Moyer (1990) do find evidence of such incentives while Collins et al. (1995), Hasan & Wall (2004), Leventis et al. (2011) do not. Others find such evidence restricted to a subset of banks (e.g. Shrieves and Dahl, 2003) [7]. Furthermore, capital management through LLP

[5] Note that loan loss reserves and capital represent measures of interest to different stakeholders and cover different aspects of the bank risk (e.g. expected and unexpected losses, respectively). They are not perfect substitutes so that it is naïf to think that banks would only be concerned about their sum.
[6] Under these circumstances, banks may also reduce credit exposures, which could lead to a credit crunch depending on the size of the overall movement.
[7] Additionally, there is recent new interest on the impact of managerial discretion involving LLP on the lending behavior (e.g. Beatty and Liao, 2011)

continues to be a relevant and timely issue for bank prudential regulation as acknowledged, for example, in the transition from Basel II to Basel III (e.g. BCBS, 2009).[8]

The works of Ahmed et al (1999) and Kim and Kross (1998) make use of the regulatory shock represented by the 1989 change in US bank capital adequacy regulations to enhance their identification strategy. The main aspect in that 1989 change consisted of the removal of the recognition of loan loss reserves from regulatory capital. This paper makes use of an opposite regulatory shock in Brazil, which involved the (temporary) *introduction* of the recognition of loan loss reserves as regulatory capital. Because of accounting tax-deductibility, the resulting net effect of an increase in (discretionary) LLP on regulatory capital became positive during the regulatory change. The change aimed at providing higher incentives for LLP of (lower capital) banks at a time when the global financial crisis was beginning to hit Brazilian markets. Huizinga and Laeven (2012) show that accounting discretion, including discretion in LLP, may be particularly exercised by banks in distressed times. In line with that finding, this paper shows evidence of capital management through LLP during the regulatory change but not outside it.

This paper contributes to the literature by presenting evidence on capital management incentives of LLP in both an emerging market and crisis-buffering context, whereas previous works have only addressed this issue in developed countries and without a crisis focus, to the best of the authors' knowledge.[9] Compared to the literature, the identification strategy of this paper is enhanced by the easy disentanglement of the non-discretionary component of LLP due to the existence of minimum (largely) non-discretionary LLR requirements in Brazil. Besides, a large available set of realized and forward loan loss variables built upon credit register data help control for any remaining expected-loss content left in the remaining discretionary provisions. More importantly,

[8] In the Basel II IRB approach (e.g. BCBS, 2006), a shortfall of eligible provisions with regard to expected losses was allowed to be deducted half / half from capital tier 1 and capital tier 2. That provided incentives for lower provisioning as, in that manner, banks would increase retained earnings and therefore capital tier 1, but only half of the shortfall to expected losses would be deducted from capital tier 1. Basel III corrected the wrong capital management incentives by making the shortfall of eligible provisions to be deducted entirely from common equity tier 1 capital. A possible investigation of the consequences of this particular modification introduced by Basel III is harmed, however, by the several other simultaneous changes to the regulatory capital definition implemented by Basel III. This paper addresses a much more isolated regulatory shock to the regulatory capital computation.

[9] This is not to say that there is no indication of capital management, apart from possible discretionary accounting decisions, in emerging markets. In the Brazilian case, see for example Alencar (2011).

this paper investigates the use of a new countercyclical tool that effectively allowed the increase of regulatory capital through recognition of excess reserves on the verge of potentially bad times. In that sense, this paper is also linked to the recent literature that examines the consequences of countercyclical regulatory capital policies (e.g. Aiyar et al., 2014; Jimenez et al., 2013, Martins and Schechtman, 2015) but is the first to consider the role played by the interaction between capital and provisions in such a countercyclical mechanism.

2. Loan loss reserves and provisions (LLR/LLP) in Brazil

Throughout this paper, loan loss reserves (LLR) refer to the stock concept whereas loan loss provisions net of reversions (LLP) refer to the flow concept. They are related by the following accounting identity.

$$\Delta LLR = LLP - \text{write-offs} \quad (1)$$

LLR in Brazil are ruled by Resolution 2682 of 1999 and still effective as of 2017. According to it, banks must classify each credit exposure into one of nine regulatory credit ratings defined by their respective minimum reserve percentages (see table 1). In this way, minimum LLR requirements have a specific reserve nature because they relate to the assessment of each loan on an individual basis. Besides, minimum LLR requirements have a strong incurred-loss aspect: loans in arrears must be classified in the regulatory ratings based mainly on the number of days past due (see table 1). For example, a loan that is 31 days past-due must be rated C at a minimum and provisioned 3% at a minimum.[10] Furthermore, loans rated H, which are provisioned 100%, must be written-off after 6 months and not before, so that there is hardly any room for bank discretion in the write-off behavior.

[10] For loans with remaining maturities greater than 3 years, table 1 is valid with the number of days past-due doubled. That modification recognizes that, for example, a 30 days past-due may represent less delinquency severity for a long loan.

Table 1: Regulation of LLR/LLP in Brazil

Regulatory rating	AA	A	B	C	D	E	F	G	H
Minimum reserves (%)	0	0.5	1	3	10	30	50	70	100
Arrears (days)	-	-	15-30	31-60	61-90	91-120	121-150	151-180	>180

Minimum LLR requirements also have a specific expected loss aspect. Ideally, some expected loss (EL) estimate of each loan should serve as the basis for regulatory classification and therefore reserve formation. This is particularly the case for loans not in arrears. For those loans, Resolution 2682 establishes general criteria for classification, such as characteristics and financial conditions of the debtor and guarantor, the nature and purpose of the transaction and sufficiency and liquidity of the guarantees.[11]

Minimum LLR are supervised by Central Bank of Brazil (CBB), making use, among other sources of information, of the Brazilian public credit register (BPCR). The register allows the CBB to check whether the minimum reserve percentages according to the number of days past-due is being obeyed. The register also allows the CBB to compare the regulatory ratings of the same borrower at different banks, particularly when it is not in arrears, and therefore to search or ask banks for the reasons behind possible discrepancies. In this way, there is little room left for bank discretion at the calculation of minimum LLR requirements. Notice also that, although there may be some room for conservatism in regulatory classifications, to the extent that such discretion is exercised in a dynamic fashion, such behavior is likely to be constrained by the difficulty in reversing conservative movements at a later stage without proper explanations.[12]

Although Brazilian banks have little discretion in calculating their minimum LLR, they can and do constitute excess LLR above the regulatory minimum. This excess LLR will play a central role in this study. Excess LLR functions as general reserves because usually it does not relate to the assessment of each individual loan[13]. This excess may

[11] All of these factors should implicitly contribute to produce at least a rough estimate of the EL of the loan that should then be classified into the regulatory rating with minimum provision percentage closer to that estimate.

[12] Indeed, a transition to a better regulatory rating has higher chances of catching the attention of the supervisor than a transition to a worse rating.

[13] It is also possible that some banks are able to produce precise loan-level EL estimates for some of their loans, so that it becomes feasible to attribute to each of them a specific reserve percentage, which may be

cover general expected losses of the whole portfolio but also contain large room for bank discretion. It is widely conjectured among market participants in Brazil that banks use this excess mostly to manage earnings and, maybe to a smaller extent, to cover general expected losses. On the other hand, there is a lot of doubt whether capital management also displays any role in the excess LLR decisions. This paper addresses all these conjectures with a particular focus on the latter.

3. Basic variables and the effect of ΔExcess LLR on regulatory capital

The excess LLR, discussed in section 2, can be formally defined as:

$$\text{Excess LLR} \equiv \text{LLR} - \text{minimum LLR} \quad (2),$$

where minimum LLR is ruled by Resolution 2682 discussed in the same section 2.

The variable of most interest in this paper is discretionary loan loss provision (Disc. LLP) defined as:

$$\text{Disc. LLP} \equiv \Delta(\text{Excess LLR}) \quad (3)$$

From (1), (2) and (3), one gets:

$$\text{Disc. LLP} = \text{LLP} - (\Delta\text{minimum LLR} + \text{write-offs}) \quad (4)$$

We define formally minimum provisions (Min LLP) and extended minimum provisions (Emin LLP) respectively as:

$$\text{Min LLP} \equiv \Delta\text{minimum LLR} \quad (5)$$

$$\text{Emin LLP} = \text{Min LLP} + \text{write-offs} \quad (6)$$

Then one arrives at equation (7):

$$\text{Disc. LLP} = \text{LLP} - \text{Emin LLP} \quad (7)$$

Equations (7) and (6) show clearly that Disc. LLP represents the component of LLP that cannot be attributed to variations of the minimum LLR or to write-offs.

in-between consecutive regulatory minimum reserve percentages. In that case, the resulting excess LLR would have a specific, rather than a general, aspect. However, those cases represent likely minor exceptions.

Therefore, as the name suggests and as discussed in section 2, it represents largely a discretionary decision of banks. The easy disentanglement of such discretionary component due to the existence of minimum LLR requirements is an advantage of this paper.

It is also worth noting that, as loan write-offs necessarily apply to loans rated H, they diminish in full the minimum LLR associated with these loans (see table 1). Consequently, write-offs do not affect Emin LLP because of (5) and (6) and that there is no mechanical impact on Disc. LLP either, according to (7). In particular, Emin LLP can be thought as the variation of minimum LLR not derived from write-offs.

Next, this section addresses the relation between Disc. LLP and regulatory capital in Brazil (assuming EMin LLP constant). An increase of x in Disc. LLP, holding Emin LLP constant, translates into an increase of x in LLP itself due to (7). Because, for accounting purposes, provisions are tax-deductible, the resulting effect is to decrease (1-t)·x of retained earnings and consequently of tier 1 regulatory capital (where t is the tax rate)[14]. Under the Brazilian standard regulation, excesses or shortfalls of LLR above or below the minimum are not subsequently added neither deducted from any level of regulatory capital. However, a regulatory change introduced by the CBB, from 2008.Q4 to 2010.Q1, allowed the excess LLR above the regulatory minimum to be recognized as tier 1 capital.[15] That was adopted out of concerns about the effects of the Brazilian economic deceleration in 2008:Q4 on the credit risk of Brazilian bank portfolios. The goal was to provide higher incentives for provisioning through the regulatory capital mechanism. During the regulatory change, the effect of an increase of x in Disc. LLP, holding Emin LLP constant, was to increase in t·x the tier 1 capital because x, the incremental growth in Excess LLR, was added back to tier 1 capital under the regulatory change. (Arithmetically, $-(1-t)\cdot x + x = t\cdot x$). The effects depicted above on regulatory capital are summarized in table 2. Therefore, the regulatory change acted effectively as a

[14] In fact, the accounting tax-deductability assumes that banks activate the deferred tax assets related to the increase in LLP, which is generally the case.
[15] Resolution 3674 of December 2008 introduced the new rule producing effects immediately whereas Resolution 3825 of December 2009 announced the cancelation of the rule starting in April 2010.

countercyclical tool that allowed the increase of regulatory capital through LLP/LLR on the verge of potentially bad times.[16, 17]

Table 2: effect on regulatory (tier 1) capital of an increase of x in the Disc. LLP[18]

Standard regulation	Regulatory change (2008.Q4-2010.Q1)
-(1-t)·x	+t·x

Naturally, if (lower capital) banks had already formed comfortable cushions of excess LLR during good times by means of a self-countercyclical behavior, the regulatory tool would be of less need from a prudential point of view. In this case, lower capital banks could consume this cushion (e.g. by making zero LLP) to absorb the higher expected losses during bad times while at the same time conserving their capital base under the standard regulation. On the other hand, note that, if self-countercyclical bank behavior is not assured or if the implied cushions (excess LLR and the capital buffer) are deemed not conservative enough in light of the unexpected magnitude of an upcoming shock (such as the global crisis and Lehman collapse in particular), the countercyclical tool studied in this paper acquires greater policy relevance.

Table 2 shows clearly that the effect of Disc. LLP on regulatory capital is negative under the standard regulation but positive during the regulatory change. If banks manage capital through Disc. LLP, lower capital banks have lower incentives for (discretionarily) provisioning under the standard regulation but higher incentives for (discretionarily) provisioning during the regulatory change. That is the identification strategy employed in this paper to check for the capital management hypothesis. In particular, since the effect of an increase in Disc. LLP, holding other factors constant, is always to decrease earnings, reported earnings and regulatory capital are affected by provisioning in opposite

[16] The term countercyclical is employed throughout the text to convey the sense that, given the increase in regulatory capital driven by the new policy, banks would be able to release their capital at that time and still maintain the same *ex-ante* level of regulatory capital.

[17] Notice that, even if some market participants focus only on the sum of capital and loan loss reserves in their analysis of the appropriateness of banks' cushions, the regulatory change still represents a change in the regulator's stance towards regulatory capital and, therefore, is likely to have factored in as such in the analysis of those market participants.

[18] More generally, if Disc. LLP, Min LLP and write-offs all vary jointly, it is easy to see that the resulting effect on tier 1 capital is -(1-t)·(ΔDisc. LLP + ΔEMin LLP) under the standard regulation and is +t·(ΔDisc. LLP) - (1-t)·(ΔEMin LLP) during the regulatory change. Notice that the sensitivity on ΔDisc. LLP is the same as in table 2.

ways during the regulatory change period, which help us to disentangle more easily these two goals of management.[19] More generally, however, this paper aims at empirically testing whether the regulatory change was a contributing factor for a supposed change of provisioning behavior of Brazilian banks. Figures 1 to 5, in the sequence, start addressing this issue.

Figure 1 below shows the evolution of total loans and LLR for the sample of Brazilian banks used in this study (later described in the text). During the regulatory change period (between vertical lines), there is clearly an increase in the trajectory of LLR in comparison to the trajectory of total loans. Besides the influence of the new regulation, as described in table 2, this gap formation may be also related to the expectation regarding the impact of the global financial crisis on the Brazilian economy. *Ex-post* it is known that this impact was short-lived - Brazilian GDP slowed down only during the two quarters after the Lehman Brothers bankruptcy (see figure 2) – and took mainly the financial form of a liquidity crisis affecting mostly small and medium banks rather than a credit crisis (e.g. Mesquita and Torós, 2010). However, as of the introduction of the regulatory change, the prospects about the nature, magnitude and duration of the crisis impact on the Brazilian economy were mostly unclear.

[Figure 1]

[Figure 2]

Figure 3 decomposes LLR into its two components: minimum LLR, governed by Resolution 2682, and the largely discretionary excess above the minimum, Excess LLR, both expressed as percentages of total loans. Notice the distinct scales where the two components evolve, with Excess LLR levels in the order of magnitude between 10% to 20% of Minimum LLR levels. Consistent with figure 1, it is possible to observe an increase in both Minimum LLR and Excess LLR during the regulatory change period. To the extent that both components of LLR retain expected loss aspects, those increases may be related to the expectation of the impact of the global financial crisis on the Brazilian

[19] To the extent that capital and earnings evolve in tandem over the cycle, the absence of the regulatory change would make our methodology mainly dependent on bank cross section variability for the purpose of disentanglement of capital and earnings management.

economy, as previously mentioned. On the other hand, given the potentially strong discretionary characteristic of the Excess LLR specifically, one is tempted to investigate what other incentives, including the new regulation, bear on its trajectory.

[Figure 3]

The investigation of the contribution of the regulatory change to banks' provisioning behavior is made easier by observing the distinct behavior of variations in excess LLR according to banks' capital positions. Figure 4 shows the trajectories of average Disc. LLP of banks that had high or low capital in the previous quarter. High or low capital banks are defined in relation to the median bank capital figure across the whole sample[20]. In the first half of the regulatory change period, and particularly in its first quarter, there is a significant increase in Disc. LLP of low capital banks in comparison to the group of high capital ones. That is consistent with the former taking advantage of the regulatory change to boost their capital position through increases in Disc. LLP. If that is the case, it seems that the largest part of the adjustment was carried out soon after the new regulation was introduced. Outside the regulatory change period, the capital management incentives of the standard regulation would suggest a pattern of high capital banks making higher Disc. LLP than low capital ones, but that is difficult to identity from figure 4.

[Figure 4]

Figure 5 details specifically the behavior of low capital banks in terms of Disc. LLP and lagged total capital. Immediately after the new regulation, Disc. LLP increases a lot while previous capital is still low compared to its past trajectory. In the following quarters of the regulatory change period, Disc. LLP returns to more modest levels whereas lagged capital becomes relatively high. This inverse relation during the regulatory change is consistent with the capital management incentives of discretionary LLP. However,

[20] Banks with too high capital are discarded from the group of high capital banks for the purposes of production of figures 3 and 4.

outside this period, there is no clear relationship between the trajectories of Disc. LLP and lagged capital.

[Figure 5]

4. Methodology

We employ a difference in treatment model to explain Disc $LLP_{i,t}$ made by bank i at time t based on a measure of adjusted capital before provisions and possibly other discretionary items (Adj. $capital_{i,t}$), on a dummy equal to 1 during the regulatory change and 0 outside it (Reg. $change_t$), on the interaction Reg. $change_t$ x Adj. $capital_{i,t}$, on earnings before taxes and provisons ($Ebtp_{i,t}$) and on several controls and bank fixed effects. Our starting model is given in equation (8). Variable Disc. LLP is normalized by quarter average loans and expressed in percentage points[21].

$$\text{Disc. } LLP_{i,t} = \alpha \cdot \text{Adj. capital}_{i,t} + \gamma \cdot \text{Reg. change}_t + \beta \cdot \text{Reg. change}_t \text{ x Adj. capital}_{i,t} + \lambda \cdot Ebtp_{i,t} + \text{controls}_{i,t} + \text{intercept} + \text{fixed effect}_i + \text{error}_{i,t} \quad (8)$$

Capital management through LLP is consistent with $\alpha > 0$ (management under standard regulation) and $\alpha + \beta < 0$ (management under regulatory change). Under these circumstances, it is also natural to expect the coefficient of the interaction β to be negative.[22] These expected signs mean that banks with lower capital make lower Disc. LLP under the standard regulation or higher Disc. LLP during the regulatory change, in order to increase their regulatory capitals.

Earnings management is consistent with $\lambda > 0$. That means that banks with lower earnings make lower Disc. LLP in order to increase their earnings[23]. There shouldn't be

[21] That means it enters the regressions scaled up by 100. The same occurs for the control variables expressed in percentage points as indicated later in this section.

[22] Unless α is found to be negative, $\beta<0$ is a necessary condition for the capital management hypothesis under the regulatory change.

[23] We abstain from considerations that smoothing may not necessarily involve trying to pursue the target in all periods. If the target is too far apart in a particular period, it may be too costly to make large LLP movements to come closer to the target due, for example, to reputational concerns. Under these circumstances, banks may opt to save discretionary movements for a later period.

any change in earnings behavior because of the regulatory change since this one only affected capital. Earnings are defined before taxes and provisions and normalized by the quarter average gross total assets. The term "gross" means gross of LLR throughout the paper.

Because some banks in our sample display a very high level of capital for issues possibly related to their business models and/or funding structure (e.g. high borrower or funding concentration) or to temporary reasons, capital management policies may be less relevant for them due to the large distance from the regulatory minimum then. Therefore, we construct a bank-time dummy variable Nthc (Not-too-high-capital) equal to one if the risk weighted total capital ratio is not too high, defined arbitrarily as below the 75% percentile of the sample distribution or, equivalently, 26% of capital ratio. We then focus on the effect of the interactions Adj. capital x Nthc and Reg. change x Adj. capital x Nthc on Disc. LLP. More specifically, our baseline model for estimation becomes equation (9), where terms involving Adj. capital x (1-Nthc) are added for the sake of completeness. This approach is similar to the one adopted by Shrieves and Dahl (2003).

$$\text{Disc. LLP}_{i,t} = \alpha \cdot \text{Adj. capital}_{N\,i,t} + \gamma \cdot \text{Reg. change}_t + \beta \cdot \text{Reg. change}_t \text{ x Adj. capital}_{N\,i,t} + \lambda \cdot \text{Ebtp}_{i,t} + \phi \cdot \text{Adj. capital}_{T\,i,t} + \theta \cdot \text{Reg. change}_t \text{ x Adj. capital}_{T\,i,t} + \text{controls}_{i,t} + \text{intercept} + \text{fixed effect}_i + \text{error}_{i,t} \quad (9)$$

$$\text{where Adj. capital}_N \equiv \text{Adj. capital x Nthc and Adj. capital}_T \equiv \text{Adj. capital x (1-Nthc)} \quad (10)$$

Baseline specifications of equation (9) include bank fixed effects to allow for bank unobservables and bank-clustered errors to deal with bank-level heterocedasticity. Notice that, in equation (9), the relative bank adjusted capital and earnings positions that matter depend only on the capital and earnings figures themselves. If, alternatively, one assumes that banks focus on their deviations of adjusted capital and earnings to varying (unobserved) targets, then the equation to be estimated becomes (11). More specifically, Adj. capital_N is replaced by (Adj. capital_N – Cap. target) and, similarly, Ebtp is replaced by (Ebtp– Earn. target).

$$\text{Discret. } LLP_{i,t} = \alpha \cdot (\text{Adj. capital}_{N\,i,t} - \text{Cap. target}) + \gamma \cdot \text{Reg. change}_t + \beta \cdot \text{Reg. change}_t \text{ x } (\text{Adj. capital}_{N\,i,t} - \text{Cap.Target}) + \lambda \cdot (Ebtp_{i,t} - \text{Earn. Target}) + \text{terms involving Adj. capital}_{T\,i,t} + \text{controls}_{i,t} + \text{intercept} + \text{fixed effect}_i + \text{error}_{i,t} \quad (11)$$

Regrouping equation (11), we obtain (12) and (13).

$$\text{Discret. } LLP_{i,t} = \alpha \cdot \text{Adj. capital}_{i,t} \text{ x } Nthc_{i,t} + \gamma \cdot \text{Reg. change}_t + \beta \cdot \text{Reg. change}_t \text{ x Adj. capital}_{i,t} \text{ x } Nthc_{i,t} + \lambda \cdot Ebtp_{i,t} + \text{terms involving Adj. capital}_{T\,i,t} + \text{controls}_{i,t} + \text{intercept} + \text{unobserved effect} + \text{error}_{i,t} \quad (12)$$

$$\text{where unobserved effect} \equiv (\alpha \cdot \text{Cap. Target} + \beta \cdot \text{Reg. change}_t \text{ x Cap. Target} + \lambda \cdot \text{Earn. Target}) + \text{fixed effect}_i \quad (13)$$

Depending on the assumptions made about the unobservable targets, we could have different specifications for the model to be estimated. If the targets are assumed constant across banks and over time, it is easy to see that the unobserved effect mingles partly with the intercept and partly with the effect of Reg. change_t. The model to be estimated remains the baseline specification (9), with bank fixed effects. If the targets are constant across banks but vary over time, estimation of (12) warrants the inclusion of time dummies (besides the bank fixed effects). Interpretation of coefficient γ may change again but not the interpretation of coefficients α and β. If the unobserved targets are constant over time but vary across banks, then it is easy to see that the appropriate specification includes bank-reg. change fixed effects (due to the interaction Reg. change_t x Cap. Target_i) instead of pure bank fixed effects. Besides the baseline specification, the other two alternative specifications are also estimated in the results section.[24]

The important explanatory variable to test for capital management is the adjusted capital ratio (Adj. $\text{Capital}_{i,t}$). The referred adjustment aims at making bank capital (i.e. numerator of the capital ratio) exogenous, by considering it before the effect of provisions and possibly other potentially discretionary decisions. The more effects are netted out, less room for endogeneity is left in the adjusted capital variable if other discretionary

[24] If the targets vary by both bank and time, bank-time fixed effects are advised but the estimation of the resulting model is not feasible since our sample comprises at most one observation per pair bank-time.

accounting decisions happen simultaneously to Disc. LLP. However, the more effects are netted out, the higher the chances of conveying a less realistic capital representation to what the banks really face when deciding on Disc. LLP and therefore introducing measurement error in the regression. This is the case if other discretionary decisions happen before Disc. LLP.[25] Two types of adjustments are considered. The first is to compute capital only before provisions, adding back its effect as in (14) (see also table 2).

$$(\text{capital before provisions})_{i,t} \equiv \text{capital}_{i,t} + (1\text{-}t) \cdot \text{provisions}_{i,t} \qquad (14)^{26}$$

The second adjustment is to compute capital before provisions and other potentially discretionary items such as changes in equity, in reserves eligible to regulatory capital and in promised dividend (and interest on capital) distributions as well as new discretionary deductions. This is accomplished by departing from the capital measure of the previous quarter, therefore before decisions on these discretionary items, and then adding earnings after taxes but before provisions and deducting new non-discretionary deductions.

$$(\text{capital before discretionarities})_{i,t} \equiv \text{capital}_{i,t-1} + (1\text{-}t) \cdot \text{Ebtp}_{i,t} - \text{new non-discretionary deductions}_{i,t} \qquad (15)$$

In both (14) and (15), provisions include not only LLP but also other provisions subject to discretion (e.g. provisions for contingent liabilities). Also, in both adjustments, current Disc. LLP is derecognized from regulatory capital during the period of the regulatory change (2008.Q4-2010.Q1), so that the adjusted capital measures are indeed before all effects of LLP.[27] Finally, the denominator of the capital ratios (i.e. risk-weighted assets RWA), is also adjusted for the deactivation of deferred tax assets related to provisions of current quarter, as in (16).

[25] Because the regulatory change did not modify incentives for other discretionary items besides Disc. LLP, we do not plan to explain several potentially discretionary items using a system of simultaneous equations as in Beatty (1995) for example.
[26] Capital_t is net of promised payment of dividends (and interest on capital).
[27] For simplicity, this has not been made explicit in equations (14) and (15).

$$\text{RWA before provisions}_{i,t} = \text{RWA}_{i,t} - \text{weight} \cdot t \cdot \text{provisions}_{i,t} \quad (16)$$

where "weight" is the risk weight applied to deferred tax assets.[28]

As the baseline case, the two previous adjustments are applied to total capital ratios as this was the most important capital constraint for banks during the sample period. However, for the sake of robustness, the adjustments are also performed on tier 1 capital ratio measures[29]. As a result, four adjusted capital ratio variables are produced: total and tier 1 capital before provisions ("TCBP" and "T1BP", respectively) and total and tier 1 capital before discritionarities ("TCBD" and "T1BD", respectively).

Finally, it is worth remarking that some other past regulatory or fiscal changes are also taken into consideration when carrying out the capital adjustments. A simplified standardized approach of Basel II was introduced in 2008.Q3, changing the RWA definition; the tax rate t increased in 2008.Q2 and the weight on deferred tax assets related to temporary differences decreased in 2008.Q4. We do not believe these change may have a material influence on our estimation results, though. [30]

The control variables to be employed in equations (9) or (12) include variables related to general expected losses, bank level characteristics relevant to provisions, macroeconomic controls and (largely) non-discretionary loan loss accounting variables. To control for the possible general EL aspect of Disc. LLP, we adopt the usual measure of variation in non-performing loans (ΔNPL), normalized here by quarter average loans and expressed in percentage points. More specifically, we control at each regression for both the realized $\Delta NPL_{i,t}$ and the forward $\Delta NPL_{i,t+1}$, as suggested by Bushman and Williams (2012). Although those authors seem to view the forward $\Delta NPL_{i,t+1}$ as the

[28] We have assumed here that banks have activated deferred tax assets related to provisions of the current time period ($t \cdot \text{provisions}_{i,t}$), though this may not always be the case.
[29] Recall that excess LLR was recognized as tier 1 capital during the regulatory change.
[30] To the extent that RWA was higher after Basel II, banks might have had additional incentives to take advantage of the later adopted regulatory capital change to boost capital through Disc. LLP. However, the interaction coefficient β is based on relative bank capital positions, so that it is not clear a priori how the RWA modification influences its estimate. Similarly, a higher tax rate or a lower risk weight on deferred tax assets might have provided additional incentives for lower capital banks to boost capital through Disc LLP during the regulatory change (see table 2 and equation 16, respectively). On the other hand, both of those changes were maintained after the end of the regulatory change period, so that they are not likely to be the driving force behind the estimates. Furthermore, notice that the effect of "weight" on the capital ratio is typically a minor one compared to changes affecting the numerator of the capital ratio such as the recognition of Disc. LLP.

appropriate control for forward-looking EL, we consider the whole pair, realized and forward ΔNPLs, as a single control for future EL. Indeed, realized ΔNPL may contain important information in adjusting expectations about EL and is included in the regressions with that sense, and not because of any incurred-loss aspect of Disc. LLP, which does not exist by construction.[31]

Several definitions of NPL are jointly employed in our regressions, based on the past-due ranges depicted in table 1. Thus ΔNPL(15-30), for example, is defined as the first difference in loans past-due between 15 and 30 days. Analogous definitions hold for ΔNPL(31-60), ΔNPL(61-90), ΔNPL(91-120), ΔNPL(121-150), ΔNPL(151-180) and ΔNPL(181-360). The construction of such ΔNPL variables relies on credit register data from BPCR. Since such variables are based on the objective criteria of arrears, there is no room for discretion in their construction, which precludes concerns of endogeneity for the contemporaneous ΔNPL_t.[32] The joint use of several NPL definitions is an advantage of our data setup and aims at providing a more accurate measure of general expected losses (EL). Notice that such probable losses include not only losses from loans not defaulted but also from loans that are typically considered in default, such as past-due more than 90 days. In the latter case, there is still uncertainty regarding the amount of recovery that can be collected. The complete assessment of the general expected losses covered by Disc. LLP is reflected on the estimated coefficients of the ΔNPL variables.[33]

Besides ΔNPLs we use several other bank-time-varying controls relevant to provisions. We control for the lagged excess LLR, as defined in (2). It is normalized by previous quarter average loans and expressed in percentage points (Lagged excess LLR). If banks tend to correct for any over or under discretionary provisioning in the past, a negative sign is to be expected. Much of the related literature uses that type of control (e.g. Beatty et al., 1995; Collins et al., 1995). We include the log of the (quarter average) gross total assets (Logat) to investigate size related conjectures, such as the political

[31] One could think of a situation where the bank forms its expectation about future NPL_{t+1} with information only up to t-1. However, at the end of the time period and just before deciding on Disc. LLP_t, information on realized NPL_t is released and the bank is only able to adjust its former expectation on NPL_{t+1} by taking into account NPL_t in a simple (additive) corrective manner.

[32] On the other hand, it is true that use of future ΔNPL_{t+1} (instead of its true unobserved expectation) may introduce measurement error and render this control endogenous. Later in the paper, we explore instrumenting this control, using NPL levels as instruments.

[33] Any remaining subjective assessment about the state of delinquency of the loans is likely captured by the regulatory ratings of table 1 and therefore by Min LLP.

sensitivity hypothesis (e.g. Moyer, 1990), in which larger banks may like to increase LLP in order to report lower earnings and, therefore, to be supposedly under less scrutiny by supervisors or regulators. Finally, the lagged size of the quarter average loan portfolio normalized by the quarter average gross total assets (Lagged Loans) and the first difference of end-of-quarter loans normalized by the quarter average loan portfolio size (Loan growth) are also included as controls, because Disc. LLP may depend on how important loans are, or are becoming, in relation to the size of bank total assets.

The macroeconomic control adopted is the quarterly seasonally-adjusted nominal GDP growth expressed in percentage points (GDP growth) in order to capture economic activity and its relation to credit risk (see figure 2). A negative sign, for example, would imply that Disc. LLP is pro-cyclical, in other words, it increases in downturns and decreases in upturns. The (largely) non-discretionary loan loss accounting variables at our disposal are Min LLP and write-offs. We adopt as our control the sum of the two, represented by Emin LLP, defined in (6). It is normalized by quarter average loans and expressed in percentage points. Equation (7) and footnote (15) suggest that Emin LLP itself may be the relevant (largely) non-discretionary variable to explain Disc LLP and its relation with bank capital.[34] The decision on discretionary provisioning may depend on the realization of the extended minimum loan loss provisions for two types of (non-exclusive) reasons. First, the link may be driven by a mechanical reaction if, for example, banks have some goal for total LLP. In that case, Disc. LLP would have to be adjusted according to variations in EMin LLP[35]. Second, the link may also be grounded in fundamentals. To the extent that both provision components measure different aspects of the loan portfolio credit risk (i.e. general aspect x specific aspect), the coefficient on EMin. LLP could translate the co-movement between the two.

Finally, it is worth remarking that, although some of the controls seem, from their definitions, to be contemporaneous to Disc. LLP, it is assumed that they realize before Disc. LLP. In fact, the assumption underlying our model and most of the related literature is that the Disc LLP decision, as any other discretionary accounting decision, is taken at

[34] As stated in section 2, write-offs are basically totally non-discretionary. Therefore, Emin LLP is *largely* non-discretionary due to the small remaining room for discretion in Min LLP.
[35]Notice that Disc LLP and Emin LLP are both mechanically invariant to write-offs

the end of the time period after non-discretionary items have realized.[36] To the extent that there is some discretionary room left in Min LLP, it is however possible that there is some degree of simultaneity between Min LLP. and Disc. LLP, which could render the former endogenous in our regressions. Therefore, in some robustness exercises, EMin LLP is excluded from the regressions or it is instrumented.

5. Sample characterization

Quarterly data represents the highest appropriate frequency for our investigation. That is the frequency that prudential capital ratios are divulged to market participants in Brazil.[37] The sample time period selected is 2005.Q2 to 2013.Q3. This period stops before the start of introduction of Basel III in Brazil, which introduced several additional changes in the numerator of banks' regulatory capital ratios. The sample period is also designed to be symmetric around the regulatory change.[38]

The selection of the sample of banks started from the 100 largest Brazilian banks in total assets and then was restricted only to domestic private banks, foreign banks and the (few) public commercial banks. Next and importantly, a material number of banks that generally make null discretionary LLP were excluded, since in those cases there is no variation to be explained by equation (9).[39] Additionally, banks with missing data on important regulatory capital items that harmed the construction of the adjusted capital variables were excluded as well as banks with outlier behavior in Disc. LLP.[40] Finally, there were exclusions of bank-time periods encompassing easily identified changes in the

[36] Notice that using only lagged controls would represent less information to what the banks really know if they undertake the discretionary LLP decision at the end of the quarter.
[37] On the other hand, complete and audited balance sheets are required to be divulged by banks only semesterly. Working with semesterly data would, however, cut approximately by half our sample size.
[38] Starting the sample period before 2005 would also incorporate a large number of banks that ceased to exist before the regulatory change.
[39] More specifically, excluded banks make approximately null Disc. LLP (< 0.001 p.p.) during the period encompassing the regulatory change and two quarters before and after it. Although it could be interesting to investigate why they behave in such a way (e.g. with the use of Tobit like models), this is out of the scope of this paper. Our results should, then, be interpreted as conditional on the universe of banks that make some use of discretionary LLP.
[40] In general, the latter consisted of excluding the pairs (bank,quarter) where |Disc LLP| > 0.3 p.p. and also all quarters of the banks with at least two occurrences of |Disc LLP| > 0.3 p.p. Those exclusions constituted few cases and acted in favor of our assumptions concerning the signs of coefficients α and β.

financial conglomerate composition (e.g. involving acquisitions or sales).[41] The resulting number of banks in the final sample is 47.

Our sample covers 1381 observations or bank-quarters. Because the regulatory change period comprises only 6 quarters (from 2008.Q4 to 2010.Q1), its number of observations is rather smaller (around one fifth) of the corresponding number for the period of the standard regulation (2005.Q2 to 2008.Q3 and 2010.Q2 to 2013.Q3). The number of observations of both periods is shown in table 3a. The table also characterizes our sample and compares the variables' means between the two periods. Most of the sample variables are not found to be significantly different between the two periods according to two-sample t-tests with unequal variances. That insignificance relates to the short number of observations of the regulatory change period. Notable exceptions are Disc. LLP and Excess LLR, which are significantly higher during the regulatory change. Part of this increase in discretionary provisions and reserves is likely connected to the worse macroeconomic environment translated by the significantly smaller GDP growth during the regulatory change. Indeed, Min LLP and Min LLR are also significantly higher during the regulatory change. In particular, this means that the increases in Disc. LLP and Excess LLR did not happen at the expense of lower Min LLP or lower Min LLR but despite their growth. Table 3a also reveals that all the adjusted and unadjusted capital variables are higher during the regulatory change, though not significantly[42]. The regulatory change might have contributed to that increase due to the positive capital effect of Disc. LLP then.

[Table 3a]

Earnings only before taxes (Ebt) are significantly lower during the regulatory change, which is possibly also related to the worse macro conditions there. Nevertheless, earnings before taxes and provisions (Ebtp) have no significant difference between the two periods, which is consistent with the previously mentioned higher level of provisions during the regulatory change. Whether provisions have been partly set to manage earnings

[41] More specifically, for each bank, we chose the financial representation that is valid for a longer period and that includes, if possible, the moments of regulatory changes.
[42] The reason why the adjusted capital variables are higher than the unadjusted ones during the regulatory change relates to the effect of Min LLP.

is a question also addressed in the next section. Additionally, it is worth remarking that, across the different NPL definitions, the largest ΔNPLs occur at the past-due ranges of (15-30), (31-60) and (181-360) for the standard regulation period and at the past-due ranges of (31-60) and (181-360) for the regulatory change period. Finally, table 3b contains, for the sake of completeness of descriptive statistics, the mean, median and standard deviation of all variables listed at table 3a and based on the whole sample period.

[Table 3b]

Table 4 offers a numeric look at the question whether capital management was a contributing factor to the behavior of discretionary provisions during the standard regulation and the regulatory change. To that goal, we compare Disc. LLP of banks with low adjusted capital to that of banks with high adjusted-capital. These two bank groups are created based on whether the TCBD variable is lower or higher than the median, conditional on banks having not too high capital (Nhtc=1). The difference of Disc LLP between the two groups is not statistically significant during the standard regulation but low adjusted-capital banks make significantly larger discretionary provisions than high adjusted-capital banks during the regulatory change. This feature lends support to the capital management incentives of discretionary provisions during the regulatory change. In the next section, we investigate whether this finding continues to hold in a multivariate setting.

[Table 4]

6. Results

Unless stated otherwise, all estimations of this section include bank fixed effects and bank clustered standard errors and are carried out for the specifications that involve either TCBP or TCBD as the adjusted capital variable. In tables 5a and 5b, we estimate equation (9) with different sets of controls, for TCBP and TCBD specifications, respectively. The departing points are models (1a) and (1b) that contain only the main variables of interest: the dummy Regulatory change, the adjusted total capital when total

capital is not too high (Adj. capital$_N$), the interaction of the these two and earnings before taxes and provisions (Ebtp). For the sake of completeness, the models also contain adjusted total capital when total capital is too high (Adj. capital$_T$) and its interaction with Regulatory change. In the subsequent models of tables 5a-5b, additional sets of controls are included sequentially.

[Table 5a]

[Table 5b]

In all models of tables 5a-5b, the coefficient γ on Regulatory Change is positive and statistically significant either at the level of 5% or 1%, meaning that banks increased Disc. LLP during the regulatory change period. That could be related to the general expected loss aspect of these provisions, having in mind that the global financial crisis hit Brazilian markets somewhat coincidently with the introduction of the regulatory change (figure 2). More importantly, however, the significantly negative coefficient β on the interaction Adj. Capital$_N$ x Reg. Change means that banks with lower adjusted capital increased more Disc. LLP during the regulatory change. Apart from models (1a), (2a), (4a) and (1b), where significance is achieved at the level of only 10%, the coefficient β is found statistically significant at 5% in the remaining models. That is consistent with bank capital management through Disc LLP during the regulatory change. This evidence is valid for both employed versions of adjusted capital measures (despite the minor fact that the significance of β at 10% occurs more frequently for the TCBP specifications). Therefore, the tradeoffs previously discussed in section 4 between the two types of capital adjustment are not materially relevant for the capital management conclusion. Furthermore, for each Adj. Capital specification, the magnitude of the interaction coefficient β increases once more controls are added to the models, apart from the last move to models (6a)-(6b). On the other hand, the coefficient on adjusted capital alone is always insignificant, so that there is no evidence of capital management outside the regulatory change period. Again, this insignificance is valid for both employed versions of adjusted capital. In models (6a)-(6b), with the full set of controls, the estimated interaction β has the value of - 1.6. Consequently, a one-standard deviation reduction in TCBP or TCBD during the regulatory change (meaning reductions of 3.6 p.p. or 4.1 p.p.,

respectively) implies increases during the same period of 0.06 p.p. or 0.07 p.p. in discretionary provisions, respectively[43]. These are substantial effects compared to the standard deviation of Disc. LLP during the regulatory change of 0.4 p.p..

It is interesting to compare the findings on capital with those on earnings. Earnings before taxes and provisions is positive and highly significant, at 1%, in all models of tables 5a-5b, suggesting earnings management throughout the sample period.[44] The estimated magnitude of the Ebtp coefficient shows a decreasing pattern until models (4a)-(4b) but reverses its trajectory thereafter. When the full set of controls are employed, its magnitude is approximately 1.9, for both adjusted capital specifications. A one-standard deviation reduction in Ebtp during the sample period (equal to 1.77 p.p.) implies a decrease of 0.033 p.p. in discretionary provisions. This is a substantial effect compared to the standard deviation of Disc. LLP during the sample period of 0.26 p.p..

The variable Adj. capital$_T$ is found insignificant in all models, whereas its interaction with Reg. change is generally significantly negative, although with magnitude around only half of the magnitude of β. The interpretation of this result is likely not related to capital management incentives due to the large distance from the regulatory minimum. Its significance may be driven by confounding factors pertained to the particular nature of banks with too high level of capital in our sample and is, therefore, of minor importance to this study.

In the sequence, we offer comments on each model more carefully and on the signs of the control variables. Since recognition and coverage of expected losses belongs conceptually to the *raison d'être* of loan loss provisions, the first set of controls included in models (2a)-(2b) comprise the usual loan loss measures of (realized) variations in non-performing loans (ΔNPL_ts). More general than the related literature that typically relies on a single criteria, ΔNPL_ts built based on all past due ranges of table 1 are jointly considered. However, none is found significant in models (2a)-(2b), which could suggest the absence of a general expected loss component in Disc. LLP. However, once forward variations ΔNPL_{t+1}s are also added in models (3a)-(3b), some cases of significance are

[43] Recall that Disc. LLP is scaled up by 100 in the estimations.
[44] Although our sample contains some banks owned and managed by small groups of shareholders, earnings smoothing is likely still important for these banks as it signals stability for debt-holders. For evidence of debt-holder information signaling in Brazil, see Forti and Schiozer (2015).

revealed.[45] The forward control ΔNPL_{t+1}(15-30) is highly significant at 1% and remains significant in all models where present. The controls ΔNPL_{t+1}(61-90) and ΔNPL_{t+1}(151-180) are weakly significant in models (3a)-(3b) but become insignificant when more controls are added in the following models. Interestingly, in the presence of forwards ΔNPL_{t+1}s, some contemporaneous ΔNPL_ts start showing significance in models (3a)-(3b). The control ΔNPL_t(15-30) becomes highly significant in models (3a)-(3b) but loses significance in the last models (6a)-(6b), whereas ΔNPL_t(61-90) and ΔNPL_t(121-150) display moderate to weak significance from models (3a)-(3b) until the end of tables 5a-5b.

The significance of many ΔNPL controls from models (3a)-(3b) onwards points indeed to the (general) expected loss component of discretionary LLP. The particular past-due ranges that are revealed significant and their signs also lend themselves to some comments. The positive significant signs of the ΔNPL controls related to the past due range of 15 to 30 days may mean that this light delinquency is probably a good leading indicator of serious delinquency in the future so that banks may want to track its behavior though Disc. LLP. Furthermore, the pervasive positive sign of the forward control ΔNPL_{t+1}(15-30) reinforces the evidence on forward-looking behavior. The positive (though not high) significance of serious past-due ranges, such as 120 to 150 days, suggests discretionary provisions also cover expected losses derived from uncertainty in recoveries of loans that are typically already considered at default.[46] Finally, the negative sign of intermediary intervals of arrears (i.e. 60 to 90 days) could imply that there is less room for discretion in the vicinity of where default is typically defined. Those past-due ranges may be related to higher minimum provisions, leading by a mechanical impact to lower Disc. LLP. Indeed ΔNPL_{t+1}(61-90) becomes insignificant in the last models where Emin LLP is included[47].

Bank variables pertained to provisioning behavior comprise the next set of controls included in models (4a)-(4b). The only statistically significant bank variable is

[45] We investigate the effect of the possible endogeneity in forward ΔNPL_{t+1} later in this section.
[46] Notice that the distance between consecutive minimum loan loss reserve percentages increases as the regulatory rating worsens in table 1. Therefore, banks may view discretionary provisions as a useful tool in the sparser section of the scale of reserve percentages.
[47] The contemporaneous ΔNPL_{t+1}(61-90) also becomes less significant in the last models, though not totally.

Lagged excess LLR. More specifically, it is negative and highly significant whenever present in the models of tables 5a-5b. The negative sign suggests that banks tend to smooth the size of the discretionary cushion represented by the excess LLR. It might be the case that too large cushions attract higher scrutinity from supervisors[48] and that too low cushions diminish the flexibility in responding to future non-discretionary increases in minimum LLR. The variable Logat is always insignificant in tables 5a-5b, so that evidence on the size-related political sensitivity hypothesis is not found. Similarly, Lagged loans and Loan growth are never significant, so that our results do not provide information on relation between the behavior of the loan portfolio and discretionary provisions. In models (5a)-(5b), we add GDP growth as our macroeconomic control. It is significantly negative at 5% whenever present in tables 5a-5b. This suggests a pro-cyclical pattern of Disc. LLP. Indeed, this variable decreases in upturns, when expected losses are also assumed to be lower, and increases in downturns. Although the finding of this pattern might have been influenced by the introduction of the regulatory change somewhat coincidently with the decline of GDP, it may also suggest an insufficient formation of comfortable cushions of excess LLR prior to the Brazilian crisis and, therefore, the appropriateness of the (countercyclical) regulatory change itself.

The last pair of models, (6a)-(6b), add the (largely) non-discretionary extended minimum provisions (Emin LLP) to the set of controls. It is negatively significant at 5%. Its magnitude implies that only 2.3% of variations in Min LLP (not derived from write-offs) could be interpreted as mechanically being passed to Disc. LLP if for example total LLP do not vary. The negative sign may also suggest that the general provision nature of Disc. LLP and the specific provision nature of Min LLP may compensate one for the other. If banks are more conservative when treating loans on an individual basis, they can be more liberal afterwards when constituting general cushions. As previously commented, some discretion left in Min LLP may render EMin LLP endogenous in our regressions. Later in the section, we investigate this issue properly.

The last pair of models of tables 5a-5b, with full set of controls, are considered the baseline cases throughout the section. Table 6 investigates the robustness of the baseline results to employing the tier 1 adjusted capital variables in place of the total adjusted capital ones. Table 6 reports the new estimated coefficients for the main

[48] Similarly to the political sensitivity hypothesis commented in section 4.

variables of interest (models (1) and (3)) and repeats the corresponding results of the baseline cases (models (2) and (4)) for the sake of comparison. Results on the main variables are qualitatively similar between the total capital and the tier 1 specifications, with the interaction coefficient β on Reg. Change x Adj. $capital_N$ remaining significantly negative for the tier 1 models. As minor notes concerning the magnitude of β, it is smaller for the tier 1 specifications (the significance in the $T1BD_N$ specification is only attained at 10%) and the discrepancy in magnitudes among tier 1 specifications is slightly larger than among total capital specifications. More importantly, the capital coefficient α on Adj. $capital_N$ remains insignificant for the tier 1 adjusted capital variables. Therefore, there is also evidence that banks have managed tier 1 capital during the regulatory change period but not outside it. Since Brazilian banks generally have the great majority of their regulatory capital in the tier 1 form (see table 3a) and given the more dynamic nature of the latter, managing tier 1 capital may be the natural way to manage total capital.[49] The estimated coefficients on Ebtp are vary close in magnitude among all the models of table 6. Finally, the results on the control variables (and on terms involving Adj. $Capital_T$) remain generally similar to before. They are omitted for the sake of space in table 6 as well as in most of the following estimations of this section.

[Table 6]

Table 7 investigates the different specifications of equation (12) associated with different assumptions about unobserved targets for capital and earnings, as discussed in section 4. For each adjusted total capital variable, TCBP or TCBD, table 7 shows results for the baseline specification with only bank fixed effects (models (1) and (4)), consistent with constant targets, for a specification including time dummies (models (2) and (5)), consistent with time-varying targets, and for a specification with bank-reg. change fixed effects, consistent with bank-level targets. Including time dummies leaves the results on the main variables of interest qualitatively unaltered: Adj. $capital_N$ insignificant, Ebtp highly significant and positive and the interaction Reg. Change × Adj. $capital_N$ significantly negative at 5%. Therefore, the evidence on capital management during

[49] The more dynamic nature of tier 1 capital means here that it is generally more easily managed (e.g. though changes in the payout ratio of dividends) than tier 2 capital, whose management could depend on new issuances of subordinated debt.

(only) the regulatory change and of earnings management throughout the sample period is robust to banks pursuing common time-varying capital and earnings targets. On the other hand, when bank-reg. change fixed effects are specified, the effect of Ebtp is still positive, though statistically weaker, but significance on the interaction coefficient β is attained only at the level of 10.6% for the TCBD specification and at non-meaningful levels for the TCBP one. Therefore, the evidence on capital management during the regulatory change is not sufficiently robust to bank-specific targets for capital. However, maybe less emphasis should be placed on the results of this last specification to the extent that bank internal capital targets could convey an unrealistic representation of the bank capital management problem. Indeed, if market participants and supervisors have some difficulty in keeping track of bank specific targets, perhaps banks would not set own specific targets either, but focus more on their capital positions relative to their peers[50]. In particular, that could be specially the case in a time when regulatory capital changes (such as the recognition of Disc. LLP) are being applied to all banks.

[Table 7]

Next, we investigate the robustness of our estimations to potential sources of endogeneity. As previously commented, some discretion left in supervised Min LLP could introduce some degree of simultaneity between Disc LLP and Emin LLP and, consequently, render the latter endogenous. On its turn, the use of forward ΔNPL_{t+1} controls introduces measurement error to what banks could know at current time, namely the expectation of ΔNPL_{t+1}. The use of the forward realization instead of its current expectation could render the former endogeneous. To check whether those sources of endogeneity are sufficiently strong to modify our main results, we follow two alternative strategies: we either drop the potentially endogeneous variables or else try to instrument them. To work on a more parsimonious setup, the new estimations are applied to the baseline models restricted to having only significant ΔNPL controls. According to tables 5a-5b, these kept ΔNPL controls are ΔNPL_{t+1}(15-30), ΔNPL_{t}(61-90) and ΔNPL_{t}(121-150). We employ, as instrument for Emin LLP, the ΔNPL control related to the most

[50] The focus on relative capital positions is consistent with constant or common time-varying capital targets.

extreme past due range, namely, 181 to 360 days of arrears. Not only it is, by construction, correlated the most to Min LLP among the past-due ranges of table 1, but also was very insignificant throughout tables 5a-5b in explaining Disc. LLP. We refrain from using lagged Emin LLP as instrument so that fixed effects can still be properly employed[51]. As instrument for $\Delta NPL_{t+1}(15\text{-}30)$ we have fewer alternatives, so that we use the corresponding lagged NPL level, namely $NPL_{t-1}(15\text{-}30)$ (normalized by lagged end-of-quarter loans). Consequently, we do not employ fixed effects when $\Delta NPL_{t+1}(15\text{-}30)$ is instrumented.

Table 8 shows the results on the main variables of interest when conducting our investigation on the effects of potential endogeneities. Models (1)-(2) are estimated without Emin LLP whereas models (3)-(4) also have forward $\Delta NPL_{t+1}(15\text{-}30)$ excluded. Models (5)-(6) have the two variables present but only Emin LLP is instrumented while in models (7)-(8) both of them are instrumented. The basic results are unaltered: the capital coefficient α on Adj. $capital_N$ remains insignificant and the interaction coefficient β on Adj. $capital_N$ x Reg. Change remains significantly negative although at only 10% for the TCBP specifications. On the other hand, for the last TCBD model (8), significance of β at 1% is achieved. It is also worth noticing that $\Delta NPL_{t+1}(15\text{-}30)$ remains significant, though weakly, in all models of table 8 , including the ones where it is instrumented. On the other hand, Emin LLP is not significant when it is the only variable instrumented but returns to significance when the forward $\Delta NPL_{t+1}(15\text{-}30)$ is also instrumented.

[Table 8]

Table 9 compares the effect of the introduction of the new regulation about the recognition of Excess LLR as capital to the effect of its later withdrawal. For that matter, the baseline models are estimated based on the sample restricted to the quarters before or equal to 2010.Q1 (models (3)-(4) concerning the investigation of the new regulation introduction) or based on the sample restricted to the quarters equal or after 2008.Q4 (models (5)-(6) concerning the investigation of the new regulation withdrawal). Models (1)-(2) are the baseline models repeated here for the sake of comparison. The results on

[51] Otherwise, the regression error would be correlated with the time-demeaned instrument. See Wooldridge (2002).

the significances of the main variables of interest do not change considerably. There are some few cases of less significance compared to the baseline cases possibly due to the smaller number of observations. Overall, we can conclude that the evidence of capital management during only the regulatory change period and of earnings management throughout the sample period is drawn by both events, the introduction and the withdrawal of the new regulation.

[Table 9]

Table 9 has additional interesting results when one compares the magnitudes of the coefficients across the models. The estimated magnitudes for the interaction coefficient β show that lower adjusted capital banks have an incremental increase in Disc. LLP smaller when entering the new regulation than the incremental decrease in Disc. LLP they experience as of the regulatory change withdrawal. In that sense, the effect of the introduction of the regulatory change was less strong than that of its withdrawal. Since the new regulation is similar to an increase in bank regulatory capitalization and the regulation withdrawal to a regulatory capital tightening, the previous results goes in line with a recent literature that shows that banks react less strongly (in an absolute sense) to favorable regulatory capital shocks than to adverse ones (e.g. Martins and Schechtman, 2014)[52]. The coefficients on Ebtp also show that the degree on earnings smoothing is much stronger after the new regulation is abolished than before it is introduced. It is possible that the global financial crisis raised the interest of banks in showing stable earnings.

The results presented so far could be partly driven by confounding factors pertained to the impact of global financial crisis in Brazil somewhat coincidently with the introduction of the regulatory change. Indeed, even if the regulatory change period lasted much longer than the Brazilian crisis, most of the action in banks' discretionary provisions occurs soon after the new regulation is established (as noted for example in figure 4). Consequently, to the extent that banks were differently affected by the crisis, they could have had somehow different incentives to manage capital and/or to vary

[52] See also Kahn et al. (2005) for another example of banks' asymmetric responses as their cost of funding varies.

discretionary provisions. Since the Brazilian crisis assumed ex-post the form of a liquidity crisis (e.g. Mesquita and Torós, 2010), we try to capture its heterogeneous influence across banks following banks' liquidity needs during the crisis proxied by their credit portfolio sales[53]. For that matter, we first build a Crisis dummy that takes the value of 1 from 2008.Q3, when Lehman Brothers collapsed, to 2009.Q1, the last of the two quarters where Brazilian GDP declined (see figure 2). Next, we construct a dummy variable entitled Liquidity need that takes the value of 1 if the bank experienced a high increase in credit portfolio sales during the crisis.[54] Banks may have changed the way they provisioned if they planned to sell a larger part of their loan portfolios soon after origination to regain liquidity during the crisis. For example, a smaller level of Disc. LLP could signal to potential buyers a lower credit risk associated with their credit portfolios in general. Even if banks retained the credit risk of the sold loans, discretionary provisions could also vary due to different accounting treatments for minimum provisions in that case.

Models (1)-(2) of table 10 contain the new estimations when the crisis dummy is included together with its interaction Crisis × Liquidity need.[55] The positive, though weakly significant, effect of Crisis could reflect a general precautionary behavior during the crisis. The interaction with Liquidity need is insignificant. In models (3)-(4), we add interactions of variables Adj. capital$_N$, Adj. capital$_T$ (omitted) and Ebtp with both Liquidity need and with Crisis, to check whether capital or earnings management through Disc. LLP interact with liquidity considerations or are affected by the crisis, respectively. Almost none of the new interactions are significant and we lose the significance on Crisis too[56]. This overall insignificance implies, in particular, that the liquidity risk aspect of the Brazilian crisis did not interfere with the credit-risk related banks' Disc. LLP responses. Nevertheless and importantly, in models (1) to (4) the results on the main variables of interest are qualitatively unchanged. There is still evidence of capital management during (only) the regulatory change and of earnings management throughout the sample period.

[53] It is possible that expectations differed from actual impacts particularly in the onset of the crisis. On the other hand, notice that the regulatory change period lasted much longer than the impact of the global crisis on Brazil.
[54] More specifically, it takes the value of 1 if the bank credit sales increase from 2008Q2 to 2009.Q1 was higher than 3% of the total credit portfolio. Seven banks reach this threshold in our sample.
[55] The effect of Liquidity need alone is not identified due to the presence of bank fixed effects.
[56] The negative significance of Liquidity need x TCBD$_N$ is an exception and may be related to the business model of banks that were affected the crisis.

In models (5)-(6), we include yet another round of interactions comprised by Crisis × Liquidity need x Adj. $capital_N$, Crisis × Liquidity need x Adj. $capital_T$ (omitted) and Crisis × Liquidity need x Ebtp. This last interaction is highly significant and positive implying that earnings smoothing became more important during the crisis for banks mostly affected by liquidity constraints. Again, the evidence of capital management during (only) the regulatory change remains robust to crisis considerations about liquidity risk. In models (4) and (6), the coefficient β becomes even highly significant.

[Table 10]

Another and more credit-risk related reason why the global financial crisis may have had an effect on our findings could derive from banks' different expectations regarding the crisis impact on their credit portfolios[57]. For example, banks with lower capital levels could have had worse expectations about the crisis impact on their credit portfolios and, therefore, raised more discretionary LLP than others. Since the crisis impact in Brazil coincided somewhat with the introduction of the regulatory change, the previous hypothesis could offer an alternative explanation for the negative sign of the capital-regulatory change interaction. Although the hypothesis lacks theoretical foundation to justify the relation between bank capital and crisis expectations, we take an agnostic view and try to capture a change in expectations during the crisis in our regressions. The way we do that is to add, besides the dummy Crisis previously defined, its interactions with the (current and forward) ΔNPL measures associated with almost all past-due ranges of table 1.[58] The resulting change in the sensitivity of discretionary provisions to the non-performing loan variables is interpreted as a change in the formation of expectations about general probable losses. That approach is carried out, for each adj. capital specification, in models (1)-(2) of table 11. The following models (3)-(4) also include the interactions Adj. $Capital_N$ x ΔNPLs, to check whether capital is related to how banks routinely form their expectations about general expected losses, and Adj. $Capital_N$

[57] In the quarters following Lehman collapse, the nature, magnitude and duration of the crisis impact on the Brazilian economy were mostly unclear.

[58] To reduce slightly the number of new coefficients to be estimated, the (current and forward) ΔNPLs related to the ranges of 150 to 180 and 180 to 360 days of arrears are excluded from the models of table 11 as well as well any interactions involving them. Recall that these past-due ranges were largely insignificant at models of tables 5a-5b.

x Crisis, to investigate as in table 10 if capital management through Disc. LLP is affected by the crisis.[59] Finally and in line with the alternative hypothesis suggested in the beginning of the paragraph, models (5)-(6) saturate the models with the inclusion of the triple interactions Crisis x ΔNPLs x Adj. $Capital_N$, to check whether formation of expectations about general probable losses during the crisis is affected by banks' capital positions.

[Table 11]

The results on the main variables of interest remain largely and qualitatively unchanged, with few modifications to note in table 11. In models (3) and (5), the significance of Reg. Change x Adj. $Capital_N$ becomes now attainable at 10% and in model (6) its p-value is 10.7%. The large number of new coefficients estimated at table 11 may be responsible for the cases of smaller statistical significance found. Overall, the conclusion of capital management during (only) the regulatory change seems to be robust to heterogeneity in credit risk expectations' formation across banks and during the crisis. The results on the new added interactions are omitted for the sake of space in table 11 but are commented in the sequence, with the caveat that the corresponding estimated coefficients are based on variations within small subsets of observations. We do find some positive significances for some interactions Crisis x ΔNPLs, so that current and forward increases in non-performing loans implied more Disc. LLP during the crisis than outside it, which we interpret as a change in the process of expectations' formation. The evidence on the interactions Adj. $Capital_N$ x ΔNPLs is ambiguous: there is either no case of significance in some models or few cases of both positive and negative significances in others. On its turn, the interaction Adj. $Capital_N$ x Crisis is insignificant in most models or shows positive significance, implying in the last case that banks with less capital made lower Disc. LLP during the crisis, opposite to the behavior found in connection to the regulatory change. Finally, we do find some negative significant signs for the triple interactions Crisis x ΔNPLs x Adj. $Capital_N$. It is thus possible that, for some unidentified reason, bank capital is related to formation of expectations about general loan losses

[59] Whenever interactions including Adj. $capital_N$ are added, analogous interactions involving Adj. $capital_T$ are also included for the sake of completeness.

during the crisis. Nevertheless, table 11 estimates show that this is not the driving force behind our main findings.

The results of tables 10 and 11 reveal that the evidence on capital (and earnings) management survive the inclusion of crisis considerations in our models. This is not to say, however, that the crisis impact on that evidence is realized only through the adoption of the crisis-buffering regulatory intervention it motivated. The fact that capital management is present only during the regulatory change period may suggest, for example, that the onset of Brazilian downturn raised the attractiveness of capital management through discretionary LLP for banks. Huizinga and Laeven (2012) show, for example, that accounting discretion, including discretion in loan loss provisions, may be particularly adopted by banks in distressed times. If that was the case, the regulatory change produced effects in bank provisioning behavior particularly because of the crisis-buffering context in which it was implemented.

To conclude this section, it is worth noting that we conduct a number of additional robustness exercises whose results are not present in the paper. We test adding additional controls such as the remaining average maturity of banks' credit portfolios, further NPL controls and time-varying flows and stocks of credit portfolio sales (with and without retention of risk). We also change the specification of equation 9 including the terms (1-Nhtc) and Reg. change x (1-Nhtc), either as new variables or replacing Adj. $capital_T$ and Reg. change x Adj. $capital_T$. Additionally, we experiment with excluding observations related to other known cases of m&a (e.g. Itaú buying Unibanco). Finally, we reestimate our regressions with errors clustered by both bank and quarter (two-way clustering). Apart from some decrease in significance in the specifications when T1BD is employed, the main results on the sign and (in)significances of Adj. Capital, Reg. Change × Adj. Capital and Ebtp are generally robust to all those exercises.

7. Conclusion

In a regulatory setup where most of the non-discretionary component of loan loss provisions (LLP) can be easily disentangled, this paper finds empirical evidence of LLP behavior consistent with capital management during a regulatory change that recognized discretionary loan loss reserves as regulatory capital. This conclusion is drawn from the

finding that banks with lower capital before discretionary accounting items increased more discretionary LLP during the regulatory change than banks with higher capital. However, the evidence on capital management is absent outside the regulatory change period since there is no statistical significant association between capital before endogenous accounting decisions and discretionary LLP under the standard regulation. On the other hand, evidence on earnings management is valid throughout the sample period: banks with lower earnings before taxes and provisions make less discretionary LLP than others. This study also points to a general expected loss component present in discretionary provisions. Its existence is inferred from the statistically significance of several contemporaneous and forward non-performing loan controls associated with different past-due ranges. Our findings are mostly based on panel regressions with bank fixed effects and bank clustered standard errors. The main results hold for different capital adjustments before potential endogenous accounting decisions and for both total capital and tier 1 capital measures. They are also robust to common time-varying (capital and earnings) targets for banks, though not to bank-specific targets. We still show that potential sources of endogeneity pertained to the use of some explanatory variables such as the regulatory minimum LLP do not affect qualitatively the evidence on capital and earnings management. Furthermore, the evidence on capital management derives from both the events represented by the introduction of the regulatory change and its later dismissal. However, the effect of the favorable shock represented by the new regulation introduction on capital management is less strong than the adverse shock as of when discretionary loan loss reserves were later derecognized from regulatory capital**.**

Since the introduction of the regulatory change was somewhat coincident with the impact of the global financial crisis on Brazil (and the crisis being a major reason for its adoption), we also test whether confounding factors pertained to the impact of the crisis drive our main results. The answer is no insofar as liquidity risk aspects of the Brazilian crisis are considered. The answer is similarly negative if one conjectures that the crisis might have been associated with heterogeneity in banks' expectations about their future loan losses. Nevertheless, the fact that the evidence on capital management is present only during the regulatory change period does not allow us to rule out that the onset of the Brazilian (short) downturn had an influence in raising the attractiveness of capital management through discretionary LLP for banks. In fact, discretion in loan loss provisions, among other types of accounting discretion, may be particularly adopted by

banks in distressed times (e.g. Huizinga and Laeven, 2012). If that was the case, the regulatory change produced provisioning effects precisely because it anticipated changes in bank behavior around crisis times and did not rely instead on absent past evidence of capital management through LLP.

The new regulation studied in this paper can be interpreted as a countercyclical tool that effectively allowed the increase of regulatory capital through LLP/LLR on the verge of potentially bad times and removed this possibility once it became clear that systemic risks had dampened. This paper sheds light on the interaction between capital and provisions in such a countercyclical mechanism. Whether such a tool could be frequently used by policy makers interested in increasing the resilience of the banking sector to future downturns or in leaning against the credit cycle is an important policy issue that deserves further research, including theoretical one.

8. References

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9. Appendix of tables

Table 3a: Sample characterization

The standard regulation period comprises the periods 2005.Q2 to 2008.Q3 and 2010.Q2 to 2013.Q3. The regulatory change period period consists of the period of time from 2008.Q4 to 2010.Q1. Disc LLP is discretinary loan loss provisions as defined by equations (2) and (3) of section 4 and normalized by the quarter average loans. TCBP (total capital before provisions) and TCBD (total capital before discretionarities) are adjusted risk-weighted total capital ratios where the adjustment is given by equation (9) or (10) of section 4, respectively. T1BP (tier 1 capital before provisions) and T1BD (tier 1 capital before discretionarities) are adjusted risk-weighted tier 1 capital ratios where the adjustment is given by equation (9) or (10), respectively. All variables TCBP, TCBDD, T1BP and T1BD also have the denominator adjusted by equation (11). The subscript N denotes the interaction with the variable Nthc, so that for example TC_N = TC x Nthc. Nthc (not too high capital) is a dummy variable equal to one if the risk weighted total capital ratio is not too high, defined arbitrality as below 26%. Ebtp are earnings before taxes and provsions, normalized by quarter average gross total assets. ΔNPL(15-30) is defined as the first difference in loans past-due between 15 and 30 days, normalized by the quarter averge loans. Analogous definitions hold for the other differences in non-performing loans. Excess LLR and Min LLR are respectively the excess and the minimum of loan loss reserves, according to equation (2) and table 1, and normalized by the quarter average loans. Logat is the log of the quarter average gross total assets. Loans is the quarter average loan portoflio size normalized by the quarter average gross total assets, whereas loan growth is the first difference of end-of-quarter loans normalized by the quarter average loan portoflio size. GDP growth is the seasonally-adjuted nominal GDP quarter growth. Min. LLP is the first difference in minimum loan loss reserves, which are governed by Resolution 2682 and table 1. Write-offs are defined implicitily by equation 1. Both Min. LLP and Write-offs are normalized by the quarter average loans. Variables with p.p. sign next to them are expressed in percentage points and enter the regressions scaled up by 100.

Variables	During standard regulation	During reg. change	Difference	t-statistic
Disc. LLP (p.p.)	0.004	0.065	0.061***	2.728
TC_N	0.123	0.127	0.004	0.757
$TCBP_N$	0.127	0.130	0.003	0.672
$TCBD_N$	0.127	0.132	0.005	1.034
$T1_N$	0.111	0.115	0.005	1.047
$T1BP_N$	0.115	0.119	0.004	0.948
$T1BD_N$	0.115	0.121	0.006	1.270
Ebt	0.006	0.004	-0.03**	-2.423
Ebtp	0.012	0.011	-0.007	-0.886
Nthc	0.744	0.737	-0.001	-0.266
$\Delta NPL(15-30)$ (p.p.)	0.022	-0.040	-0.062	-1.286
$\Delta NPL(31-60)$ (p.p.)	0.021	-0.154	-0.175	-0.783
$\Delta NPL(61-90)$ (p.p.)	0.014	0.027	0.014	0.422
$\Delta NPL(91-120)$ (p.p.)	0.003	0.029	0.026	0.060
$\Delta NPL(121-150)$ (p.p.)	0.008	-0.002	-0.010	-0.060
$\Delta NPL(151-180)$ (p.p.)	0.007	0.020	0.012	0.825
$\Delta NPL(181-360)$ (p.p.)	0.025	0.203	0.178	1.448
Excess LLR (p.p.)	0.336	0.490	0.155***	3.429
Min LLR (p.p.)	4.717	5.437	0.721*	1.943
Logat	21.918	21.891	-0.027	-0.189
Loans	0.491	0.493	0.002	0.125
Loan growth	0.063	0.040	-0.023	-1.424
GDP growth (p.p.)	0.889	0.575	-0.315***	-2.890
Min LLP (p.p.)	0.034	0.473	0.439**	2.561
Write-offs (p.p.)	0.954	0.831	-0.123	-0.997
Number of observations	1133	248		

Table 3b: Descriptive statistics

Descriptive statistics are based on the period from 2005.Q2 to 2013.Q3. Disc LLP is discretinary loan loss provisions as defined by equations (2) and (3) of section 4 and normalized by the quarter average loans. TCBP (total capital before provisions) and TCBD (total capital before discretionarities) are adjusted risk-weighted total capital ratios where the adjustment is given by equation (9) or (10) of section 4, respectively. T1BP (tier 1 capital before provisions) and T1BD (tier 1 capital before discretionarities) are adjusted risk-weighted tier 1 capital ratios where the adjustment is given by equation (9) or (10), respectively. All variables TCBP, TCBDD, T1BP and T1BD also have the denominator adjusted by equation (11). The subscript N denotes the interaction with the variable Nthc, so that for example TC_N = TC x Nthc. Nthc (not too high capital) is a dummy variable equal to one if the risk weighted total capital ratio is not too high, defined arbitrality as below 26%. Ebtp are earnings before taxes and provsions, normalized by quarter average gross total assets. ΔNPL(15-30) is defined as the first difference in loans past-due between 15 and 30 days, normalized by the quarter averge loans. Analogous definitions hold for the other differences in non-performing loans. Excess LLR and Min LLR are respectively the excess and the minimum of loan loss reserves, according to equation (2) and table 1, and normalized by the quarter average loans. Logat is the log of the quarter average gross total assets. Loans is the quarter average loan portoflio size normalized by the quarter average gross total assets, whereas loan growth is the first difference of end-of-quarter loans normalized by the quarter average loan portoflio size. GDP growth is the seasonally-adjuted nominal GDP quarter growth. Min. LLP is the first difference in minimum loan loss reserves, which are governed by Resolution 2682 and table 1. Write-offs are defined implicitily by equation 1. Both Min. LLP and Write-offs are normalized by the quarter average loans. Variables with p.p. sign next to them are expressed in percentage points and enter the regressions scaled up by 100.

Variables	Mean	Median	Std. Dev.
Disc. LLP (p.p.)	0.014	0.000	0.263
TC_N	0.124	0.146	0.079
$TCBP_N$	0.128	0.151	0.081
$TCBD_N$	0.128	0.150	0.082
$T1_N$	0.112	0.125	0.075
$T1BP_N$	0.115	0.130	0.077
$T1BD_N$	0.116	0.130	0.078
Ebt	0.006	0.005	0.018
Ebtp	0.011	0.009	0.017
Nthc	0.743	1.000	0.437
ΔNPL(15–30) (p.p.)	0.011	0.000	0.784
ΔNPL(31–60) (p.p.)	-0.009	0.000	1.779
ΔNPL(61–90) (p.p.)	0.016	0.000	0.436
ΔNPL(91–120) (p.p.)	0.007	0.000	0.632
ΔNPL(121–150) (p.p.)	0.006	0.000	1.252
ΔNPL(151–180) (p.p.)	0.009	0.000	0.221
ΔNPL(181–360) (p.p.)	0.056	0.000	1.627
Excess LLR (p.p.)	0.363	0.020	0.619
Min LLR (p.p.)	4.844	3.864	6.092
Logat	21.913	21.718	2.403
Loans	0.491	0.472	0.246
Loan growth	0.059	0.045	0.200
GDP growth (p.p.)	0.830	0.995	1.306
Min LLP (p.p.)	0.108	0.156	3.343
Write-offs (p.p.)	0.933	0.449	3.370

Table 4: Differences between Disc. LLP across banks during the standard and the new regulation

	During standard regulation	During regulatory change	Difference	t-statistic
Banks with low adjusted capital	0.004	0.116	0.112***	3.250
Banks with high adjusted capital	0.017	0.015	-0.002	-0.037
Difference	-0.013	0.101**		
t-statistic	-0.992	1.995		

Banks with low adjusted capital are those banks whose TCBD are below the median of the TCBD distribution. Banks with high adjusted capital are those banks whose TCBD are above the median of the TCBD distribution. The computation is based only on banks that do not have too high capital (Nthc=1).

Table 5a: Regressing discretionary loan loss provisions on capital ($TCBP_N$), earnings and regulatory change effects- with varying sets of observable controls

The dependent variable is Disc. LLP, computed as the first difference of excess LLR normalized by the quarter average loans. TCBP is the risk weighted total regulatory capital ratio before provisons. Subscript N denotes interaction with Nthc and subscript T interaction with (1-Nthc). Nthc is a dummy variable equal to 1 if the risk-weighted total capital ratio is not too high. Regulatory change dummy variable equal to one for quarters between 2008.Q4 and 2010.Q1, when the regulory change was effective . Ebtp is earnings before taxes and provsions. Realized ΔNPL(15-30) is the current quarter first difference in loans past-due between 15 and 30 days; Forward ΔNPL(15-30) is the next quarter first difference in loans past-due between 15 and 30 days. Analogous definitions hold for the other differences in non-performing loans related to the other past-due ranges. Excess LLR is the excess in loan loss reserves above the regulatory minimum. Logat is the log of gross total assets. Loans is the quarter average loan portoflio size whereas loan growth is the first difference of end-of-quarter loans. GDP growth is the seasonally-adjuted nominal GDP quarter growth. Emin LLP denotes extended minimum loan loss provisions defined as the sum of Min. LLP, the first difference in minimum loan loss reserves, and Write-offs, the loans writen-off in the quarter. All control definitions are contained in section 4 or table 3. "Yes" indicates the set of controls or fixed effects is included while "No" indicates it is not. Robust standard errors in parentheses are clustered at the bank level. Symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
$TCBP_N$	0.021	0.024	0.042	-0.134	-0.119	-0.044
	(0.259)	(0.265)	(0.258)	(0.190)	(0.191)	(0.187)
Regulatory change	0.258**	0.266**	0.310**	0.372**	0.406**	0.385**
	(0.115)	(0.115)	(0.120)	(0.155)	(0.152)	(0.152)
Regulatory change x $TCBP_N$	-1.127*	-1.169*	-1.440**	-1.548*	-1.783**	-1.629**
	(0.616)	(0.608)	(0.642)	(0.811)	(0.773)	(0.777)
Ebtp	2.131***	2.083***	2.020***	1.707**	1.755***	1.854***
	(0.618)	(0.620)	(0.648)	(0.636)	(0.646)	(0.684)
$TCBP_T$	-0.063	-0.056	-0.057	-0.064	-0.068	-0.029
	(0.153)	(0.148)	(0.140)	(0.087)	(0.091)	(0.098)
Regulatory change x $TCBP_T$	-0.463*	-0.565**	-0.727*	-0.885**	-0.977**	-0.893**
	(0.275)	(0.270)	(0.365)	(0.436)	(0.431)	(0.423)
Realized ΔNPL(15-30)		-0.003	0.031***	0.027***	0.027***	0.017
		(0.021)	(0.009)	(0.009)	(0.010)	(0.011)
Realized ΔNPL(31-60)		0.006	0.011	0.004	0.001	-0.002
		(0.010)	(0.013)	(0.011)	(0.011)	(0.011)
Realized ΔNPL(61-90)		-0.028	-0.044*	-0.047**	-0.051**	-0.040*
		(0.030)	(0.024)	(0.024)	(0.023)	(0.022)
Realized ΔNPL(91-120)		-0.014	0.002	-0.002	-0.005	-0.003
		(0.025)	(0.013)	(0.012)	(0.012)	(0.012)
Realized ΔNPL(121-150)		0.014	0.057**	0.042*	0.037	0.039*
		(0.012)	(0.027)	(0.023)	(0.023)	(0.022)
Realized ΔNPL(151-180)		0.024	0.066*	0.028	0.028	0.042
		(0.054)	(0.038)	(0.026)	(0.026)	(0.028)
Realized ΔNPL(181-360)		0.015	0.005	0.001	0.001	0.004
		(0.012)	(0.008)	(0.009)	(0.009)	(0.010)
Forward ΔNPL(15-30)			0.077***	0.064***	0.063***	0.056**
			(0.022)	(0.023)	(0.023)	(0.023)
Forward ΔNPL(31-60)			0.003	-0.005	-0.007	-0.007
			(0.014)	(0.013)	(0.013)	(0.012)
Forward ΔNPL(61-90)			-0.031*	-0.033**	-0.031*	-0.021
			(0.017)	(0.016)	(0.016)	(0.015)
Forward ΔNPL(91-120)			0.000	-0.008	-0.011	-0.010
			(0.018)	(0.013)	(0.014)	(0.015)
Forward ΔNPL(121-150)			0.025	0.017	0.015	0.013
			(0.017)	(0.016)	(0.016)	(0.017)
Forward ΔNPL(151-180)			0.134*	0.093	0.091	0.081
			(0.074)	(0.073)	(0.073)	(0.072)
Forward ΔNPL(181-360)			0.000	-0.002	-0.002	0.001
			(0.021)	(0.020)	(0.020)	(0.021)
Lagged Excess LLR				-0.163***	-0.158***	-0.155***
				(0.044)	(0.045)	(0.045)
Logat				-0.017	-0.022	-0.016
				(0.014)	(0.014)	(0.015)
Lagged Loans				0.069	0.058	0.069
				(0.065)	(0.064)	(0.069)
Loan growth				0.085	0.112	0.120
				(0.081)	(0.087)	(0.087)
GDP growth					-0.020**	-0.020**
					(0.010)	(0.010)
Emin LLP						-0.023**
						(0.010)
Constant	-0.020	-0.021	-0.028	0.398	0.524	0.407
	(0.046)	(0.047)	(0.045)	(0.309)	(0.325)	(0.329)
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1,480	1,480	1,429	1,381	1,381	1,381
R-squared	0.020	0.028	0.082	0.143	0.151	0.159

Table 5b: Regressing discretionary loan loss provisions on capital ($TCBD_N$), earnings and regulatory change effects- with varying sets of observable controls

The dependent variable is Disc. LLP, computed as the first difference of excess LLR normalized by the quarter average loans. TCBD is the risk weighted total regulatory capital ratio before potentially discretionary decisions. Subscript N denotes interaction with Nthc and subscript T interaction with (1-Nthc). Nthc is a dummy variable equal to 1 if the risk-weighted total capital ratio is not too high. Regulatory change dummy variable equal to one for quarters between 2008.Q4 and 2010.Q1, when the regulory change was effective . Ebtp is earnings before taxes and provsions. Realized ΔNPL(15-30) is the current quarter first difference in loans past-due between 15 and 30 days; Forward ΔNPL(15-30) is the next quarter first difference in loans past-due between 15 and 30 days. Analogous definitions hold for the other differences in non-performing loans related to the other past-due ranges. Excess LLR is the excess in loan loss reserves above the regulatory minimum. Logat is the log of gross total assets. Loans is the quarter average loan portoflio size whereas loan growth is the first difference of end-of-quarter loans. GDP growth is the seasonally-adjuted nominal GDP quarter growth. Emin LLP denotes extended minimum loan loss provisions defined as the sum of Min. LLP, the first difference in minimum loan loss reserves, and Write-offs, the loans writen-off in the quarter. All control definitions are contained in section 4 or table 3. "Yes" indicates the set of controls or fixed effects is included while "No" indicates it is not. Robust standard errors in parentheses are clustered at the bank level. Symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
$TCBD_N$	0.040	0.030	0.024	-0.107	-0.107	-0.082
	(0.246)	(0.248)	(0.241)	(0.173)	(0.174)	(0.175)
Regulatory change	0.258**	0.271**	0.324***	0.371***	0.410***	0.389***
	(0.113)	(0.112)	(0.113)	(0.138)	(0.140)	(0.143)
Regulatory change x $TCBD_N$	-1.134*	-1.199**	-1.517**	-1.536**	-1.810**	-1.649**
	(0.602)	(0.579)	(0.580)	(0.685)	(0.694)	(0.717)
Ebtp	2.137***	2.090***	2.035***	1.716***	1.775***	1.889***
	(0.623)	(0.624)	(0.658)	(0.637)	(0.649)	(0.686)
$TCBD_T$	-0.067	-0.066	-0.077	-0.052	-0.068	-0.053
	(0.163)	(0.157)	(0.148)	(0.080)	(0.085)	(0.092)
Regulatory change x $TCBD_T$	-0.390	-0.512*	-0.727**	-0.846**	-0.954**	-0.874**
	(0.257)	(0.261)	(0.316)	(0.351)	(0.369)	(0.368)
Realized ΔNPL(15-30)		-0.003	0.030***	0.026***	0.025**	0.016
		(0.021)	(0.009)	(0.010)	(0.010)	(0.012)
Realized ΔNPL(31-60)		0.004	0.013	0.006	0.003	-0.001
		(0.010)	(0.013)	(0.011)	(0.010)	(0.011)
Realized ΔNPL(61-90)		-0.028	-0.044*	-0.048**	-0.051**	-0.040*
		(0.030)	(0.024)	(0.023)	(0.023)	(0.021)
Realized ΔNPL(91-120)		-0.014	0.001	-0.003	-0.006	-0.004
		(0.025)	(0.013)	(0.011)	(0.012)	(0.012)
Realized ΔNPL(121-150)		0.011	0.062**	0.047**	0.042*	0.044*
		(0.011)	(0.027)	(0.023)	(0.022)	(0.022)
Realized ΔNPL(151-180)		0.025	0.064	0.025	0.026	0.040
		(0.056)	(0.038)	(0.026)	(0.026)	(0.028)
Realized ΔNPL(181-360)		0.015	0.005	0.001	0.001	0.004
		(0.013)	(0.008)	(0.009)	(0.009)	(0.010)
Forward ΔNPL(15-30)			0.077***	0.064***	0.063**	0.056**
			(0.023)	(0.024)	(0.024)	(0.023)
Forward ΔNPL(31-60)			0.007	-0.000	-0.002	-0.002
			(0.013)	(0.012)	(0.012)	(0.011)
Forward ΔNPL(61-90)			-0.032*	-0.035**	-0.033**	-0.022
			(0.017)	(0.016)	(0.016)	(0.015)
Forward ΔNPL(91-120)			0.001	-0.007	-0.010	-0.009
			(0.018)	(0.013)	(0.014)	(0.015)
Forward ΔNPL(121-150)			0.028	0.020	0.019	0.017
			(0.017)	(0.016)	(0.016)	(0.017)
Forward ΔNPL(151-180)			0.132*	0.092	0.090	0.080
			(0.074)	(0.074)	(0.073)	(0.073)
Forward ΔNPL(181-360)			0.000	-0.002	-0.002	0.001
			(0.022)	(0.020)	(0.020)	(0.021)
Lagged Excess LLR				-0.162***	-0.157***	-0.155***
				(0.044)	(0.045)	(0.045)
Logat				-0.017	-0.023	-0.018
				(0.015)	(0.015)	(0.015)
Lagged Loans				0.068	0.054	0.062
				(0.065)	(0.063)	(0.068)
Loan growth				0.070	0.095	0.104
				(0.074)	(0.079)	(0.079)
GDP growth					-0.021**	-0.021**
					(0.010)	(0.010)
Emin LLP						-0.023**
						(0.010)
Constant	-0.023	-0.021	-0.024	0.404	0.553	0.459
	(0.044)	(0.044)	(0.042)	(0.329)	(0.348)	(0.351)
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1,480	1,480	1,429	1,381	1,381	1,381
R-squared	0.021	0.029	0.084	0.144	0.153	0.160

Table 6: Impact of the regulatory change on Disc. LLP - with total capital and tier 1 capital ratios

The dependent variable is Disc. LLP, computed as the first difference of excess LLR normalized by the quarter average loans. Adjusted capital is the regulatory capital ratio before provisons or, more genrally, potentially discretionary decisions. Adjusted capital is defined as one of the follow ing adjusted risk w eighted capital ratios: TCBP, TCBDD, T1BP or T1BD. Subscript N denotes interaction w ith Nthc and subscript T interaction w ith (1-Nthc). Nthc is a dummy variable equal to 1 if the risk-w eighted total capital ratio is not too high. Regulatory change dummy variable equal to one for quarters betw een 2008.Q4 and 2010.Q1, w hen the regulory change w as effective. NPL controls comprise realized and forw ard ΔNPLs relative to the follow ing past-due ranges in days : 15-30, 31-60, 61-90, 91-120, 121-150, 151-180 and 181-360. Bank controls comprise lagged LLR, Logat, Lagged loans and Loan grow th. The macro control is GDP grow th. The largely non-discretionary accounting loan loss control is EMin. LLP, defined as Min LLP + Write-offs. All control definitions are contained in section 4 or table 3. "Yes" indicates the set of controls or fixed effects is included w hile "No" indicates it is not. Robust standard errors in parentheses are clustered at the bank level. Symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Variables	(1)	(2)	(3)	(4)
Adj. Capital$_N$ =	$T1BP_N$	$TCBP_N$	$T1BD_N$	$TCBD_N$
Adjusted capital$_N$	-0.052	-0.044	-0.092	-0.082
	(0.222)	(0.187)	(0.198)	(0.175)
Regulatory change	0.305***	0.385**	0.292**	0.389***
	(0.104)	(0.152)	(0.109)	(0.143)
Regulatory change x Adjusted capital$_N$	-1.306**	-1.629**	-1.212*	-1.649**
	(0.599)	(0.777)	(0.632)	(0.717)
Ebtp	1.800**	1.854***	1.834**	1.889***
	(0.697)	(0.684)	(0.694)	(0.686)
Terms involving Adj. Capital$_T$	Yes	Yes	Yes	Yes
Realized NPL controls	Yes	Yes	Yes	Yes
Forw ard NPL controls	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes
Macro control	Yes	Yes	Yes	Yes
Non-discretionary accounting loan loss variables	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes
Number of observations	1,381	1,381	1,381	1,381
R-squared	0.157	0.159	0.157	0.160

Table 7: Impact of the regulatory change on Disc. LLP - alternative regression specifications

The dependent variable is Disc. LLP, computed as the first difference of excess LLR normalized by the quarter average loans. Adjusted capital is the regulatory capital ratio before provisons or, more genrally, potentially discretionary decisions. Adjusted capital is defined as one of the follow ing adjusted risk w eighted capital ratios: TCBP or TCBDD. Subscript N denotes interaction w ith Nthc and subscript T interaction w ith (1-Nthc). Nthc is a dummy variable equal to 1 if the risk-w eighted total capital ratio is not too high. Regulatory change dummy variable equal to one for quarters betw een 2008.Q4 and 2010.Q1, w hen the regulory change w as effective. NPL controls comprise realized and forw ard ΔNPLs relative to the follow ing past-due ranges in days : 15-30, 31-60, 61-90, 91-120, 121-150, 151-180 and 181-360. Bank controls comprise lagged LLR, Logat, Lagged loans and Loan grow th. The macro control is GDP grow th. The largely non-discretionary accounting loan loss control is EMin. LLP, defined as Min LLP + Write-offs. All control definitions are contained in section 4 or table 3. "Yes" indicates the set of controls or fixed effects is included w hile "No" indicates it is not. Robust standard errors in parentheses are clustered at the bank level. Symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Adj. Capital$_N$ =	$TCBP_N$			$TCBD_N$		
Adjusted capital$_N$	-0.044	-0.020	-0.102	-0.082	-0.055	-0.124
	(0.187)	(0.186)	(0.167)	(0.175)	(0.182)	(0.151)
Regulatory change	0.385**	0.413**		0.389***	0.440***	
	(0.152)	(0.167)		(0.143)	(0.148)	
Regulatory change x Adjusted capital$_N$	-1.629**	-1.794**	-1.000	-1.649**	-1.928**	-3.022
	(0.777)	(0.821)	(1.179)	(0.717)	(0.764)	(1.835)
Ebtp	1.854***	1.920***	1.480**	1.889***	1.965***	1.620**
	(0.684)	(0.669)	(0.609)	(0.686)	(0.672)	(0.623)
Terms involving Adj. Capital$_T$	Yes	Yes	Yes	Yes	Yes	Yes
Realized NPL controls	Yes	Yes	Yes	Yes	Yes	Yes
Forw ard NPL controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes
Macro control	Yes	Yes	Yes	Yes	Yes	Yes
Non-discretionary accounting loan loss variables	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	No	Yes	Yes	No
Times dummies	No	Yes	No	No	Yes	No
Bank- Reg. Change fixed effects	No	No	Yes	No	No	Yes
Number of observations	1,381	1,381	1,299	1,381	1,381	1,299
R-squared	0.159	0.180	0.208	0.160	0.183	0.217

Table 8: Impact of the regulatory change on Disc. LLP - robustness to potential endogeneities

The dependent variable is Disc. LLP, computed as the first difference of excess LLR normalized by the quarter average loans. Adjusted capital is the regulatory capital ratio before provisons or, more genrally, potentially discretionary decisions. Adjusted capital is defined as one of the follow ing adjusted risk w eighted capital ratios: TCBP or TCBDD. Subscript N denotes interaction w ith Nthc and subscript T interaction w ith (1-Nthc). Nthc is a dummy variable equal to 1 if the risk-w eighted total capital ratio is not too high. Regulatory change dummy variable equal to one for quarters betw een 2008.Q4 and 2010.Q1, w hen the regulory change w as effective. Forw ard ΔNPL(15-30) is the next quarter first difference in loans past-due betw een 15 and 30 days. Wnen required its instrument is the corresponding lagged NPL level. Realized ΔNPL(60-90) is the current quarter first difference in loans past-due betw een 60 and 90 days. Realized ΔNPL(120-150) is the current quarter first difference in loans past-due betw een 120 and 150 days. EMin. LLP is largely non-discretionary accounting loan loss control, defined as Min LLP + Write-offs. When required its instrument is the realized ΔNPL(180-360). Bank controls comprise lagged LLR, Logat, Lagged loans and Loan grow th. The macro control is GDP grow th. All control definitions are contained in section 4 or table 3. "Yes" indicates the set of controls or fixed effects is included w hile "No" indicates it is not. Robust standard errors in parentheses are clustered at the bank level. Symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Adj. $Capital_N$ =	$TCBP_N$	$TCBD_N$	$TCBP_N$	$TCBD_N$	$TCBP_N$	$TCBD_N$	$TCBP_N$	$TCBD_N$
$Adjusted\ capital_N$	-0.166	-0.078	-0.142	-0.082	-0.142	-0.075	0.193	0.245
	(0.211)	(0.191)	(0.203)	(0.180)	(0.228)	(0.184)	(0.218)	(0.217)
Regulatory change	0.359**	0.396***	0.349**	0.352**	0.353**	0.388***	0.259**	0.338***
	(0.160)	(0.146)	(0.146)	(0.137)	(0.150)	(0.149)	(0.105)	(0.090)
Regulatory change x $Adjusted\ capital_N$	-1.526*	-1.745**	-1.435*	-1.460**	-1.483*	-1.683**	-1.085*	-1.544***
	(0.833)	(0.737)	(0.758)	(0.706)	(0.769)	(0.790)	(0.592)	(0.511)
Ebtp	1.959***	1.964***	1.789***	1.782***	1.976***	1.992***	2.465***	2.504***
	(0.678)	(0.680)	(0.622)	(0.617)	(0.680)	(0.688)	(0.575)	(0.577)
Forw ard ΔNPL(15-30)	0.045*	0.045*			0.044*	0.045*	0.169*	0.166*
	(0.025)	(0.024)			(0.024)	(0.024)	(0.098)	(0.097)
Realized $\Delta NPL(61-90)$	-0.009	-0.009	-0.033*	-0.032*	-0.009	-0.008	0.019	0.019
	(0.018)	-0.018	(0.017)	(0.017)	(0.018)	(0.018)	(0.025)	(0.025)
Realized $\Delta NPL(121-150)$	0.010	0.010	0.002	-0.001	0.013	0.013	0.013	0.014
	(0.008)	(0.008)	(0.002)	(0.002)	(0.022)	(0.023)	(0.012)	(0.011)
Emin LLP					-0.005	-0.006	-0.021**	-0.020*
					(0.035)	(0.037)	(0.010)	(0.010)
Terms involving Adj. $Capital_T$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Instrumented variables	-	-	-	-	Emin LLP	Emin LLP	Emin LLP and Forw . ΔNPL15-30	Emin LLP and Forw . ΔNPL15-30
Number of observations	1,381	1,381	1,429	1,429	1,381	1,381	1,372	1,372
R-squared	0.132	0.135	0.108	0.109	0.138	0.141		

Table 9: Impact of the regulatory change on Disc. LLP - introduction and withdrawal of the regulatory change

The dependent variable is Disc. LLP, computed as the first difference of excess LLR normalized by the quarter average loans. Adjusted capital is the regulatory capital ratio before provisons or, more genrally, potentially discretionary decisions. Adjusted capital is defined as one of the following adjusted risk weighted capital ratios: TCBP or TCBDD. Subscript N denotes interaction with Nthc and subscript T interaction with (1-Nthc). Nthc is a dummy variable equal to 1 if the risk-weighted total capital ratio is not too high. Regulatory change dummy variable equal to one for quarters between 2008.Q4 and 2010.Q1, when the regulory change was effective. NPL controls comprise realized and forward ΔNPLs relative to the following past-due ranges in days : 15-30, 31-60, 61-90, 91-120, 121-150, 151-180 and 181-360. Bank controls comprise lagged LLR, Logat, Lagged loans and Loan growth. The macro control is GDP growth. The largely non-discretionary accounting loan loss control is EMin. LLP, defined as Min LLP + Write-offs. All control definitions are contained in section 4 or table 3. "Yes" indicates the set of controls or fixed effects is included while "No" indicates it is not. Robust standard errors in parentheses are clustered at the bank level. Symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Sample=	Full		Only introduction of Reg. Change.		Only withdrawal of Reg. Change	
Adj. $Capital_N$ =	$TCBP_N$	$TCBD_N$	$TCBP_N$	$TCBD_N$	$TCBP_N$	$TCBD_N$
$Adjusted\ capital_N$	-0.044	-0.082	-0.320	-0.150	-0.039	-0.541
	(0.187)	(0.175)	(0.274)	(0.209)	(0.250)	(0.332)
Regulatory change	0.385**	0.389***	0.297**	0.327**	0.451**	0.422**
	(0.152)	(0.143)	(0.138)	(0.133)	(0.185)	(0.197)
Regulatory change x $Adjusted\ capital_N$	-1.629**	-1.649**	-1.304*	-1.483**	-2.126**	-2.001*
	(0.777)	(0.717)	(0.775)	(0.734)	(1.014)	(1.073)
Ebtp	1.854***	1.889***	1.410**	1.397**	5.547**	5.802**
	(0.684)	(0.686)	(0.630)	(0.629)	(2.162)	(2.168)
Terms involving $Adj.\ Capital_T$	Yes	Yes	Yes	Yes	Yes	Yes
Realized NPL controls	Yes	Yes	Yes	Yes	Yes	Yes
Forward NPL controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes
Macro control	Yes	Yes	Yes	Yes	Yes	Yes
Non-discretionary accouting loss variables	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Sample	2005Q2-2013Q3	2005Q2-2013Q3	2005Q2-2010Q1	2005Q2-2010Q1	2008Q4-2013Q3	2008Q4-2013Q3
Number of observations	1,381	1,381	792	792	837	837
R-squared	0.159	0.160	0.164	0.166	0.210	0.216

Table 10: Impact of the regulatory change on Disc. LLP - robustnes to liquidity risk aspects prompted by the impact of the global financial crisis

The dependent variable is Disc. LLP, computed as the first difference of excess LLR normalized by the quarter average loans. Adjusted capital is the regulatory capital ratio before provisons or, more genrally, potentially discretionary decisions. Adjusted capital is defined as one of the follow ing adjusted risk w eighted capital ratios: TCBP or TCBDD. Subscript N denotes interaction w ith Nthc and subscript T interaction w ith (1-Nthc). Nthc is a dummy variable equal to 1 if the risk-w eighted total capital ratio is not too high. Regulatory change dummy variable equal to one for quarters betw een 2008.Q4 and 2010.Q1, w hen the regulory change w as effective. Crisis is a dummy variable equal to one from 2008.Q3 to 2009.Q1. Liquidity need is a dummy variable equal equal to one if the bank experienced a high increase in credit portfolio sales during the crisis. NPL controls comprise realized and forw ard ΔNPLs relative to the follow ing past-due ranges in days : 15-30, 31-60, 61-90, 91-120, 121-150, 151-180 and 181-360. Bank controls comprise lagged LLR, Logat, Lagged loans and Loan grow th. The macro control is GDP grow th. The largely non-discretionary accounting loan loss control is EMin. LLP, defined as Min LLP + Write-offs. All control definitions are contained in section 4 or table 3. "Yes" indicates the set of controls or fixed effects is included w hile "No" indicates it is not. Robust standard errors in parentheses are clustered at the bank level. Symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

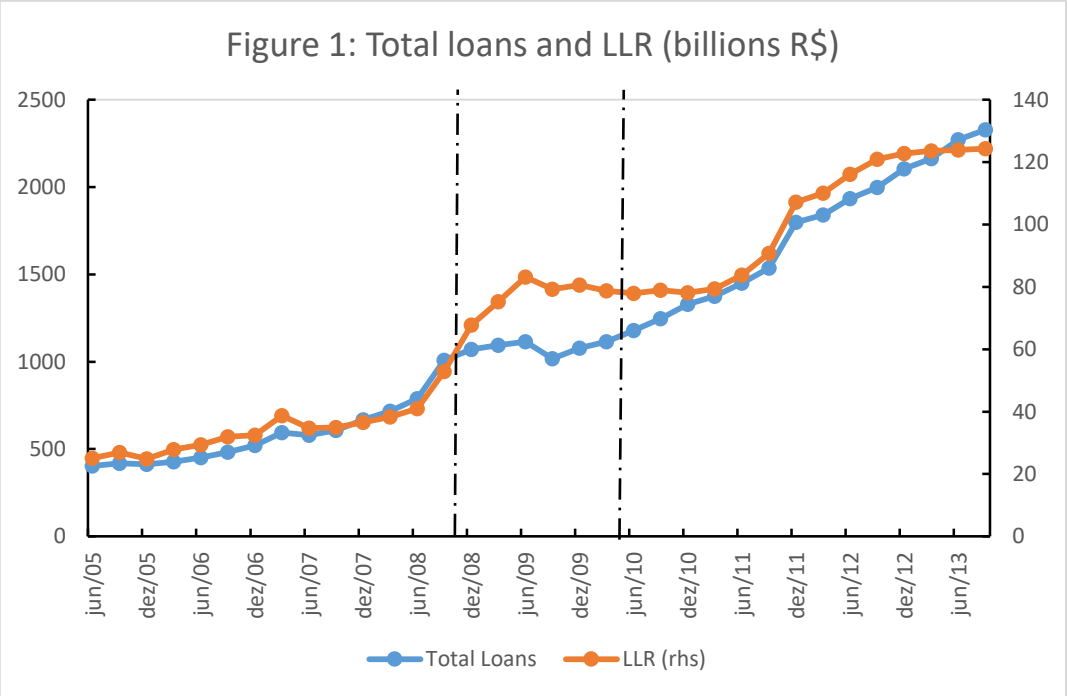
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Adj. $Capital_N$ =	$TCBP_N$	$TCBD_N$	$TCBP_N$	$TCBD_N$	$TCBP_N$	$TCBD_N$
$Adjusted\ capital_N$	-0.034	-0.077	-0.035	0.030	-0.005	0.061
	(0.195)	(0.180)	(0.221)	(0.229)	(0.221)	(0.231)
Regulatory change	0.374**	0.376**	0.422***	0.398***	0.422***	0.391***
	(0.150)	(0.140)	(0.153)	(0.124)	(0.154)	(0.123)
Regulatory change x $Adjusted\ capital_N$	-1.657**	-1.666**	-1.945**	-1.792***	-1.946**	-1.750***
	(0.779)	(0.718)	(0.807)	(0.613)	(0.819)	(0.613)
Ebtp	1.839**	1.879**	1.667**	1.654**	1.753**	1.733**
	(0.700)	(0.699)	(0.736)	(0.709)	(0.748)	(0.722)
Crisis	0.055*	0.056*	-0.108	0.004	-0.029	0.069
	(0.030)	(0.030)	(0.140)	(0.141)	(0.133)	(0.147)
Crisis x Liquidity need	0.033	0.029	0.042	0.031	-0.490	-0.430
	(0.101)	(0.100)	(0.105)	(0.104)	(0.342)	(0.288)
Adj. $Capital_N$ x Liquidity need			-0.251	-0.628*	-0.512	-0.823**
			(0.460)	(0.355)	(0.418)	(0.388)
Ebtp x Liquidity need			0.269	0.145	-0.288	-0.343
			(1.877)	(1.828)	(1.656)	(1.654)
Crisis x Adj. $Capital_N$			0.823	0.105	0.454	-0.209
			(0.765)	(0.734)	(0.767)	(0.807)
Crisis x Ebtp			1.764	2.836	0.480	1.683
			(2.774)	(2.500)	(2.633)	(2.418)
Crisis x Adj. $Capital_N$ x Liquidity need					2.766	2.438
					(2.387)	(1.667)
Crisis x Ebtp x Liquidity need					10.148***	8.716***
					(3.313)	(2.993)
Terms involving Adj. $Capital_T$	Yes	Yes	Yes	Yes	Yes	Yes
Realized NPL controls	Yes	Yes	Yes	Yes	Yes	Yes
Forw ard NPL controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes
Macro control	Yes	Yes	Yes	Yes	Yes	Yes
Non-discretionary accounting loan loss vari	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1,337	1,337	1,337	1,337	1,337	1,337
R-squared	0.163	0.164	0.166	0.168	0.171	0.173

Table 11: Impact of the regulatory change on Disc. LLP - robustnes to to heterogeneity in banks' expectations about their future loan losses

The dependent variable is Disc. LLP, computed as the first difference of excess LLR normalized by the quarter average loans. Adjusted capital is the regulatory capital ratio before provisons or, more genrally, potentially discretionary decisions. Adjusted capital is defined as one of the follow ing adjusted risk w eighted capital ratios: TCBP or TCBDD. Subscript N denotes interaction w ith Nthc and subscript T interaction w ith (1-Nthc). Nthc is a dummy variable equal to 1 if the risk-w eighted total capital ratio is not too high. Regulatory change dummy variable equal to one for quarters betw een 2008.Q4 and 2010.Q1, w hen the regulory change w as effective. Crisis is a dummy variable equal to one from 2008.Q3 to 2009.Q1. Liquidity need is a dummy variable equal equal to one if the bank experienced a high increase in credit portfolio sales during the crisis. NPL controls comprise realized and forw ard ΔNPLs relative to the follow ing past-due ranges in days : 15-30, 31-60, 61-90, 91-120 and 121-150. Bank controls comprise lagged LLR, Logat, Lagged loans and Loan grow th. The macro control is GDP grow th. The largely non-discretionary accounting loan loss control is EMin. LLP, defined as Min LLP + Write-offs. All control definitions are contained in section 4 or table 3. "Yes" indicates the set of controls or fixed effects is included w hile "No" indicates it is not. Robust standard errors in parentheses are clustered at the bank level. Symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Adj. $Capital_N$ =	$TCBP_N$	$TCBD_N$	$TCBP_N$	$TCBD_N$	$TCBP_N$	$TCBD_N$
$Adjusted\ capital_N$	-0.087	-0.122	-0.124	-0.120	-0.127	-0.135
	(0.197)	(0.178)	(0.158)	(0.154)	(0.157)	(0.154)
Regulatory change	0.356**	0.377**	0.353**	0.350***	0.309**	0.281**
	(0.145)	(0.144)	(0.147)	(0.126)	(0.140)	(0.124)
Regulatory change x $Adjusted\ capital_N$	-1.522**	-1.643**	-1.500*	-1.495**	-1.220*	-1.068
	(0.731)	(0.729)	(0.755)	(0.624)	(0.723)	(0.651)
Ebtp	1.895***	1.934***	1.648**	1.792***	1.653**	1.796**
	(0.686)	(0.684)	(0.640)	(0.641)	(0.673)	(0.685)
Crisis	0.066**	0.064**	-0.007	0.087	-0.248*	-0.138
	(0.030)	(0.030)	(0.124)	(0.140)	(0.140)	(0.136)
Terms involving Adj. $Capital_T$	Yes	Yes	Yes	Yes	Yes	Yes
Realized ΔNPL controls	Yes	Yes	Yes	Yes	Yes	Yes
Forw ard ΔNPL controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes
Macro control	Yes	Yes	Yes	Yes	Yes	Yes
Non-discretionary accounting loan loss variables	Yes	Yes	Yes	Yes	Yes	Yes
Interactions Crisis x ΔNPL	Yes	Yes	Yes	Yes	Yes	Yes
Interactions Crisis x Adj. Capital	No	No	Yes	Yes	Yes	Yes
Interactions Adj. Capital x ΔNPL	No	No	Yes	Yes	Yes	Yes
Interactions Crisis x Adj. Capital x ΔNPL	No	No	No	No	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1381	1381	1381	1381	1381	1381
R-squared	0.165	0.168	0.19	0.199	0.214	0.223

10. Appendix of figures



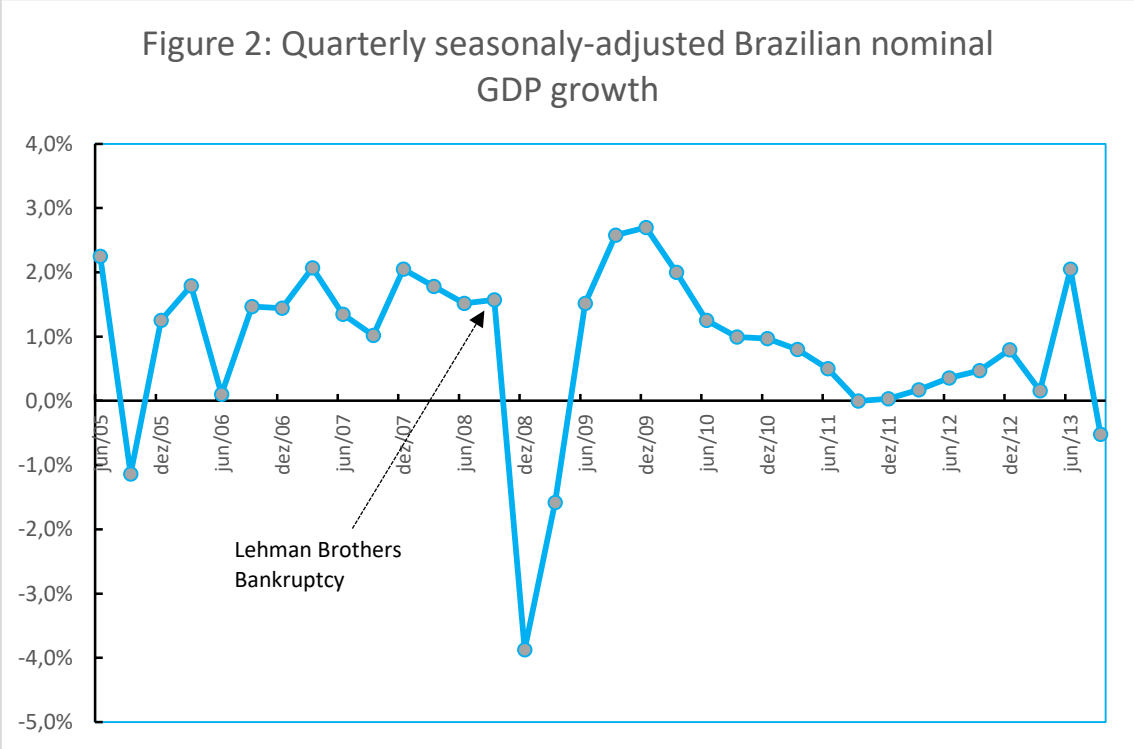


Figure 3: Minimum and Excess LLR as percentage of Total loans

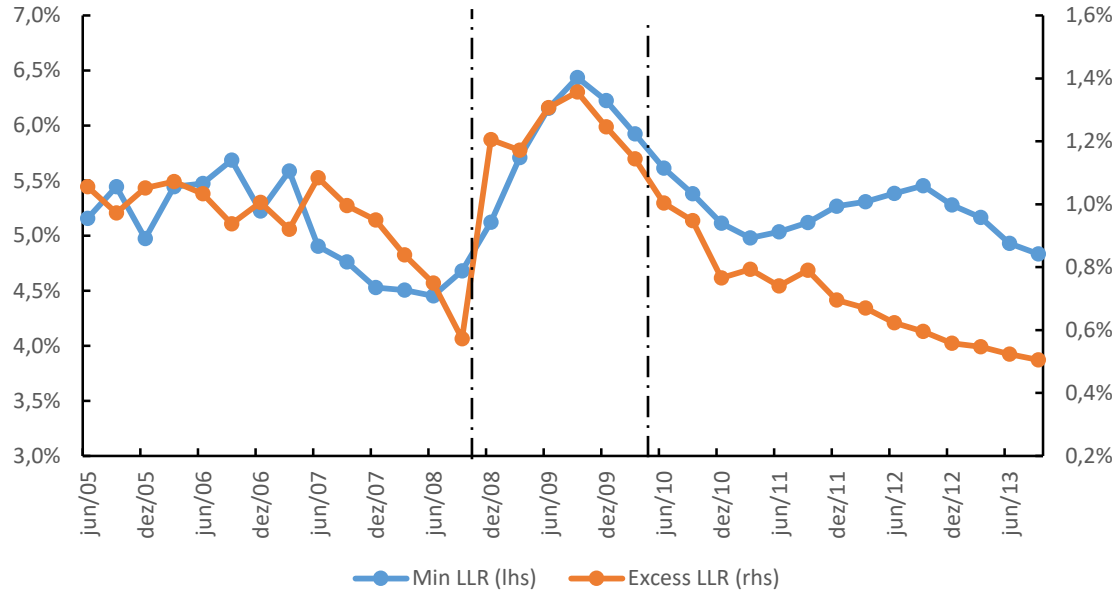
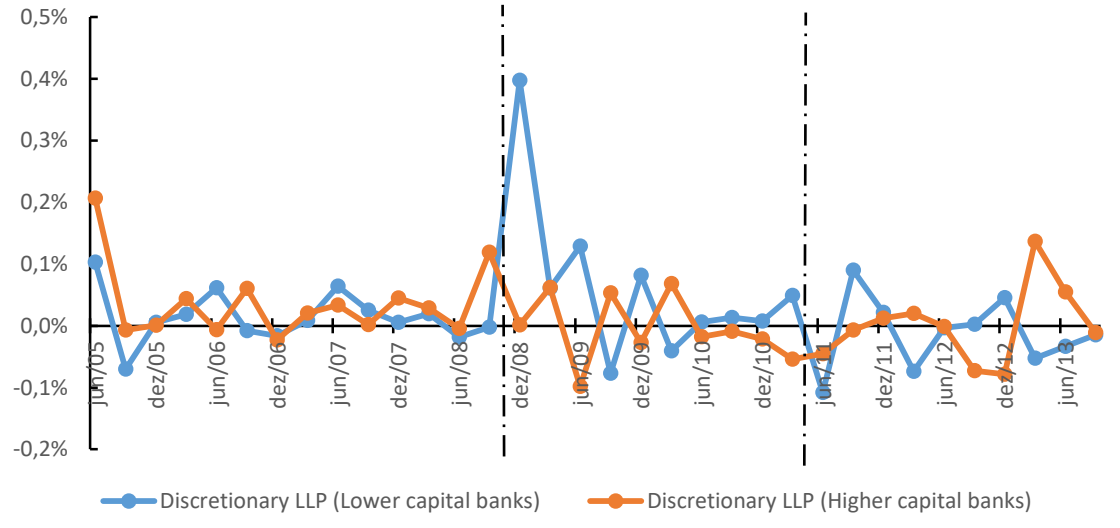


Figure 4: Behavior of discretionary LLP according to capital position



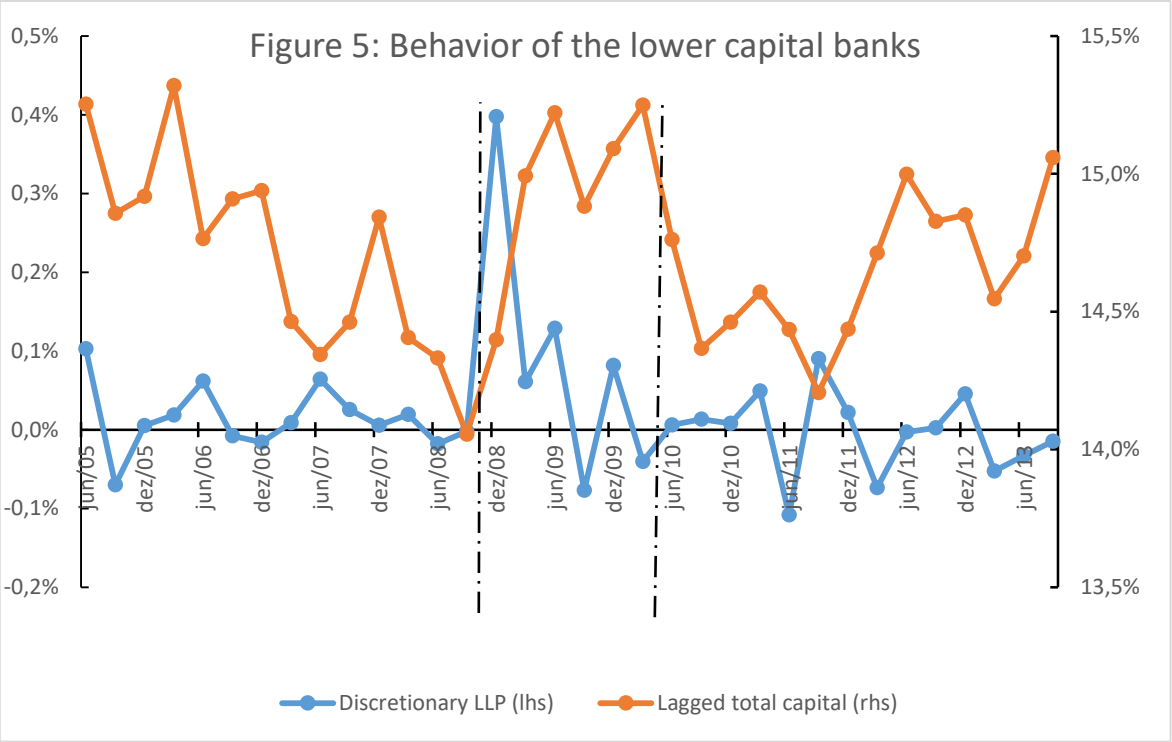


Figure 5: Behavior of the lower capital banks
0,5%
0,4%
0,3%
0,2%
0,1%
0,0%
-0,1%
-0,2%
15,5%
15,0%
14,5%
14,0%
13,5%
jun/05
dez/05
jun/06
dez/06
jun/07
dez/07
jun/08
dez/08
jun/09
dez/09
jun/10
dez/10
jun/11
dez/11
jun/12
dez/12
jun/13
Discretionary LLP (lhs)
Lagged total capital (rhs)